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MACKENZIE VALLEY PIPELINE INQUIRY

Government
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS
CROWN LANDS WITHIN THE YUKON TERRITORY AND
THE NORTHWEST TERRITORIES, and
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY
THAT MIGHT BE GRANTED ACROSS CROWN LANDS
WITHIN THE NORTHWEST TERRITORIES,
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE
and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

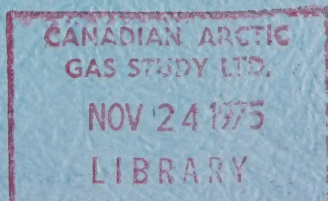
Yellowknife, N.W.T.

November 8, 1975.

PROCEEDINGS AT INQUIRY

Volume 84

347
M835
Vol. 84



MACOMACK VALLEY RAILROAD PROJECT

- IN THE MATTER OF APPLICATION BY STATE OF
- (a) CHANGING THE RAIL LINE FROM THE
- RIGHT-OF-WAY THAT WOULD BE ACQUIRED ACROSS
- CROWN LANDS WITHIN THE STATE TERRITORY AND
- THE NORTHWEST TERRITORY, AND
- (b) ERECTING FENCE LINES FOR A RAILROAD
- THAT WOULD BE ACQUIRED ACROSS CROWN LANDS
- WITHIN THE NORTHWEST TERRITORY,
- FOR THE PURPOSE OF A PROPOSED RAILROAD PROJECT

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND

ECONOMIC IMPACT OF THE PROPOSED

OPERATION AND CONSTRUCTION OF THE RAILROAD

PROPOSED RAILROAD

(Before the Honorable Mr. Justice Gauthier)

Yellowknife, N.W.T.

November 3, 1975.

PROCEEDINGS AT YELLOWK

Volume 84

APPEARANCES:

Mr. Ian G. Scott, Q.C.,
Mr. Stephen T. Goudge,
Mr. Alick Ryder and
Mr. Ian Roland for Mackenzie Valley Pipeline
Inquiry;

Mr. Pierre Genest, Q.C.,
Mr. Jack Marshall, and
Mr. Darryl Carter for Canadian Arctic Gas
Pipeline Limited;

Mr. Reginald Gibbs, Q.C. &
Mr. Alan Hollingworth for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &
Prof. Alastair Lucas for Canadian Arctic Resources
Committee;

Mr. Glen W. Bell and
Mr. Gerry Sutton for Northwest Territories
Indian Brotherhood, and
Metis Association of the
Northwest Territories;

Mr. John Bayly or
Miss Leslie Lane for Inuit Tapirisat of Canada,
and The Committee for
Original Peoples Entitle-
ment;

Mr. Ron Veale and
Mr. Allen Lueck for The Council for the Yukon
Indians;

Mr. Carson H. Templeton, for Environment Protection
Board;

Mr. David Reesor for Northwest Territories
Association of Municipal-
ities;

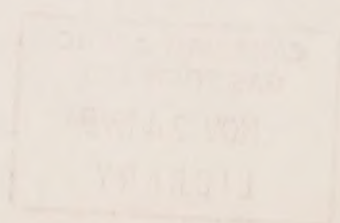
Mr. Murray Sigler for Northwest Territories
Chamber of Commerce.

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CANADIAN ARCTIC
GAS STUDY LTD.

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I N D E X

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WITNESSES FOR CANADIAN ARCTIC GAS PIPELINE LIMITED:

R.L. HARLAN

R.A. HEMSTOCK

Peter J. McCART

Miss Gretchin V. MINNING

Guy Leslie WILLIAMS

- Cross-Examination by Mr. Anthony (cont) 12525

- Cross-Examination by Mr. Bayly (cont) 12581

EXHIBITS:

309 Supplemental List of Reports & Studies re
CARC and NAG, October 1975 12524

1 Yellowknife, N.W.T.,

2 November 8, 1975

3 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

4 THE COMMISSIONER: Go ahead.

5 MR. ANTHONY: Mr. Commissioner,
6 before proceeding with the cross-examination on the
7 water portion which was largely covered, at least my
8 cross-examination was largely covered by Mr. Scott in
9 the terrain portion of his cross-examination, which may
10 be good news ; but before I proceed on with that I
11 would like to table something with your permission with
12 the Inquiry.

13 Under your preliminary rulings
14 you asked the participants to prepare and distribute
15 lists of reports and studies referred to, or that have
16 been prepared by them, and pursuant to these rulings
17 we have filed a list for the ^{Northern} Assessment Group and
18 Canadian Arctic Resources Committee, and we now have
19 a supplemental list which is basically the reports and
20 studies that have been prepared by the Northern
21 Assessment Group. In view of this Inquiry's interest
22 and assistance in ensuring that environmental native
23 groups have access to technical information and witnesses,
24 I thought that instead of merely exchanging it
25 I would table a copy with the Inquiry and that list
26 which I have given to my friends will then therefore
27 be tabled, with your permission. It indicates there
28 are a number of about 26 reports and studies that
29 have been prepared by the Northern Assessment Group.

30 All of these, I should say,

1 will ultimately in some form or another form part of
2 the evidence before this Inquiry. They are designed
3 and for that purpose.

4 I should add that many of the
5 reports are indicated as being in draft or in prelim-
6 inary form. We have attempted in most cases to utilize
7 the information that's available as evidence before
8 this Inquiry, and therefore for funding and personnel
9 reasons we have limited many of these reports and
10 instead, have taken the subsequent effort that's
11 required and channelled that towards the preparation of
12 witnesses and the preparation of evidence for this
13 Inquiry. Most of that evidence is to come at later
14 stages in this Inquiry. Some as early as the environ-
15 mental phase. These reports are available in Ottawa
16 and if any of the members or my friends here wish to
17 have copies, if they will let me know I will ensure
18 that I bring them up and have them available in
19 Yellowknife also.

20 THE COMMISSIONER: Well, the
21 list that you are offering this morning will be marked
22 as an exhibit then.

23 (SUPPLEMENTAL LIST OF REPORTS & STUDIES RE
24 CARC & NAG, DATED OCTOBER 1975, MARKED EXHIBIT 309)

25 MR. HOLLINGWORTH: I think
26 the questions come for circle to me, sir, and I have
27 no questions on water of this panel.

28 THE COMMISSIONER: Well, Mr.
29 Anthony, did you get the lectern out?

30 MR. ANTHONY: In anticipation.

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 Mr. Commissioner, before I
2 pursue a few additional points, there were a number of
3 issues that were raised by Mr. Scott in his cross-
4 examination and I would like to, in a couple of
5 particular instances, just follow it just a bit
6 further so that I understand the evidence he presented.
7 In particular, I'd like to take a moment to look at
8 this question of the spoil removed at river crossings, this
9 would be ice-rich material that has been taken out and
10 replaced by select backfill at ^{the} river crossing locations.
11

12 R.L. HARLAN,
13 R.A. HEMSTOCK,
14 PETER J. MCCART,
15 GRETCHIN V. MINNING,
16 GUY LESLIE WILLIAMS, resumed:

17 CROSS-EXAMINATION BY MR. ANTHONY (CONTINUED):

18 Q If I understand Mr. Will-
19 iams' evidence, the intention is to place that spoil
20 back on the right-of-way where it would then melt and
21 form part of the material cover on the right-of-way.
22 I just wanted to find out from Dr. McCart, whether he
23 had any comments on this particular technique, and in
24 particular if he has any recommendations and suggestions
25 of how this spoil should be disposed of in and around
26 river crossings.

27 WITNESS MCCART: Well, my
28 recommendation would be that any organic material or
29 other fine material should be placed, or would have
30 to be placed off the right-of-way in such a situation
that it could not enter natural waters, whatever that
entailed.

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1
2 Q You say "off the right-
3 of-way", both off the cut of the right-of-way and
4 also off any slope that would run into the right-of-
5 way and ultimately into the water course?

6 A If they were placed on a
7 slope, as I say, they would have to^{be} placed in such a
8 fashion that you could be assured that no significant
9 amounts of sediment would be able to find their way
10 downslope and into natural water courses, yes.

11 Q Mr. Williams, how would
12 you then recommend this material be disposed of so as
13 to provide the protections that Dr. McCart requires?

14 WITNESS WILLIAMS: This was the
15 last question of the day, I think, wasn't it, Mr.
16 Anthony, yesterday, or just about anyway and I think
17 that discussion got turned around in the middle some
18 way and I was too thick to pick it up; but Mr. Scott
19 started talking about cuts, right-of-way cuts to
20 facilitate the movement of construction equipment and
21 to facilitate construction, and from there he eased
22 into select backfill and I didn't pick it up and I
23 think if you read the record -- if it ever comes out --
24 it's not going to make too much sense.

25 MR. SCOTT: We have a joint
26 responsibility for that, Mr. Williams.

27 WITNESS WILLIAMS: But now
28 are we talking about right-of-way cuts at river banks
29 to facilitate construction, is that what we're talking
30 about?

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

MR. ANTHONY:

Q Well, I didn't want to

get into the construction problem in too much detail.

I think from the construction panel and earlier panels
we got an indication of the volume of spoil that will
be available as a result of being replaced by select
backfill, and I just wanted to get an indication of
how you propose to ensure that the sediment from the
thawing of this spoil does not enter into the water
courses.

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1
2 A I would like to make it
3 clear, Mr. Anthony, that this is not necessarily one
4 and the same thing. If we take the northern rivers,
5 for instance, they have gravelled banks with fairly
6 clean gravel. Those cuts in the right-of-way, if they
7 are found necessary, can be restored.

8 Now, there are other areas
9 and I don't think the bulk of them would be at riverbanks
10 where there is high ice content material and it is
11 mainly in the northern end of the route where there is
12 not necessarily very much topography. It is generally
13 flat and gently rolling land.

14 In these areas, there are
15 stretches that have very high ice content material
16 some of it, you know, ranging from pure ice to 50% ice,
17 say. What I was trying to say is the very high ice
18 content material that is going to be replaced with a
19 granular backfill that that high ice content material
20 can be spread over the berm or over the right-of-way
21 and it is going to melt in the following summer without,
22 in my opinion, too much problem.

23 Now, can we get to a--can
24 we deal with a specific that is bothering you?

25 Q I thought I had a specific
26 and I am not quite sure I can pinpoint it right now, but
27 I will if you give me a moment. Can we deal with the
28 question in the terms that you have set it out? That
29 is, in the areas of high ice content soil with the
30 gentle rolling terrain that you have identified. Now,

Harlan, Hemstock, McCart,
Minning, Williams
Cross-Exam by Anthony

1
2 in those areas, do you propose to take any precautions
3 to ensure that there is no runoff from the right-of-way
4 into water courses?

5 WITNESS HARLAN: This is a part
6 of normal^{drainage} and erosion control measures that would be
7 provided.

8 Q Well, you are dealing
9 now with things like re-vegetation and so on or what
10 are you referring to?

11 A Re-vegetation--the physical
12 control measures such as the diversion dikes, dispersion
13 berms and the mound breaks.

14 Q And you are satisfied that
15 these dikes and berms will provide the adequate protec-
16 tion to ensure that none of this runoff from the spoil
17 enters into water courses?

18 A Yes.

19 Q And no further techniques
20 or control berms, or no further recommendations with
21 respect to location of this spoil is required.

22 A Well, I would visualize
23 in some instances you would want to remove the material
24 and say place it in a say a borrow pit.

25 Q Do you have any recommen-
26 dation as to the distance that this dispersal should
27 take place from water courses?

28 Dr. McCart, would you make
29 any recommendations as to how close to water courses this
30 material should be deposited?

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

WITNESS McCART: A I

1
2
3 would like to comment first that in my answer to your
4 first question I was referring to the situations where
5 it might be necessary to remove spoil and place it in
6 gravel pits and this kind of thing.

7 I think that each of these
8 situations we have to have a site specific sort of
9 assessment of how far it should be placed away and
10 some places, it could be five feet away. If it were on
11 the other side of a rock wall or something like this.
12 In other instances, it may have to be a considerable
13 distance away depending on the situation and the
14 hydrological regime and so forth of these particular
15 areas.

16 I don't think that you
17 can make a general recommendation except that have to
18 examine these on a site specific basis and assure
19 yourself that the materials will not enter natural
20 water courses.

21 Let me qualify that to
22 some extent. During certain parts of the year, of course,
23 every little space between hummocks is a natural water
24 course in some of these areas. I think we have to
25 confine ourselves to perennial streams, or something of
26 this nature, or which may have significant populations
27 of fish or other organisms.

28 Q So, from your point of
29 view, you would have to be satisfied that there is
30 some form of sediment trap whether it is five feet,

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1
2 fifty feet, or a quarter of a mile between the disposal
3 of this material and the water courses of concern to
4 you.

5 A Right. In some cases of
6 course sediment trap could be the natural vegetation,
7 a leave strip or something of this nature. In other
8 cases, you may want to construct a berm and place
9 settling basins between the material and the berm so
10 that the materials are unlikely to move down the slope.

11 Q You can foresee then
12 guidelines or techniques that should be employed beyond
13 those required for the drainage and erosion control and
14 in the usual course of construction?

15 A Here again, I am not
16 talking about the normal drainage and erosion control
17 along the right-of-way which that I am fairly satisfied
18 should work in most instances. I am talking about
19 specialized situations where yes, you may find that
20 as you proceed to the final design stages an area of
21 high ice content soils where you may have to remove
22 it from the right-of-way. I think that Mr. Williams
23 has said that he doesn't expect ^{that} this kind of thing is
24 going to occur with any great frequency along the right-
25 of-way where it may be necessary to remove soils and
26 place them at some distance from the pipeline.

27 Q Mr. Williams, again so
28 I can understand your recommendation with respect to the
29 dispersal of this spoil. Do you intend also to disperse
30 it on ice over water courses?

Harlan, Hemstock, McCart,
Minning, Williams
Cross-Exam by Anthony

.WITNESS WILLIAMS: A No, I

wouldn't think so, unless it was pure ice.

Q So

A Unless it was pure ice.

Q Unless the spoil was

pure ice?

A Right. The spoil that is

being replaced.

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

1
2 Q I would also like to
3 follow a further point in respect to the question of
4 icings. We have dealt with it in the terrain context
5 and also the geotechnical panel has spent some con-
6 siderable time discussing the problem and the extent
7 and so on. But as I understand, and I would like to
8 perhaps concentrate on something like the North slope
9 rivers, I think we are in agreement and, Dr. McCart, you
10 would agree that it is essential that we maintain the
11 sub-surface flow on those rivers where, that freeze,
12 normally freeze to the river bottom.

13 WITNESS MCCART: Yes. Let me
14 go back again. You must maintain, we are not terribly
15 concerned about sub-surface flow that continues on into
16 lagoons and things of this sort because I don't think
17 that your going to find that there are fish in those
18 lagoons that are dependent on sub-surface flow. I am
19 concerned about situations in which sub-surface flow
20 may come to the surface again in the spring and harbor
21 a population of fish, not just sub-surface flow.

22 Q Sub-surface flow would be
23 essential in some circumstances, would it not?

24 A Where it would come to the
25 surface again and provide a flow of surface water for an
26 over-wintering or let's say spawning population of fish.
27 Those are the circumstances that we are concerned about.

28 Q And am I not right in saying
29 that at times there, the water from springs which provides
30 the oxygen and the warmer water for over-wintering areas,

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

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flows from the spring area to the over-wintering area
through sub-surface drainage?

A Where you have a spring,
it then goes underground and surfaces again and the fish
are over-wintering below the point where it comes to
the surface for the second time? There may be situations
like that, yes. I can't think of one of the North
Slope, in the Yukon at least. We think that that sort
of thing occurs on a few rivers in Alaska. And I might
add that we have spent a considerable amount of effort
trying to locate these areas.

13

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Q I don't want to get into
too much detail at this stage on the fish question,
which I am sure we will be able to discuss at some
length later on, but let me deal with the question in
the more general terms, in terms of icing. As I under-
stand the evidence that was lead, the, to insure that
the frost bulb ^{does} / not completely cut off any surface or
sub-surface flow in those rivers. The remedial
^{geo-}recommended by the/technical panel is the use of these
insulated pipes through the frost bulb and that you,
Dr. McCart, have you studied that technique and are you
satisfied that that will, in all circumstances across
the North Slope, solve your problem?

26

27

28

29

30

A Well I haven't studied the
^{however} technique. I think/someone pointed out a few days ago
that the thinking has come around to the, an alternative
possibility simply insulating the pipe let me point
out that there is a plan to go in where we suspect that

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

1
2 this might occur, and drill and see whether in fact,
3 there is some indication that frost bulb might impede
4 these aquifers and maybe Dr. Harlan could comment
5 further.

6 WITNESS HARLAN: Maybe I should
7 clarify a point. The proposed use of the buried culvert
8 through ^{what} /would be the frost bulb is one of several
9 alternative techniques that are being considered. I
10 don't think we have ruled out, for example, insulation
11 of the pipeline itself. Our evidence suggests that a
12 very small amount of insulation, several inches of
13 insulation is sufficient, say in area of high convective
14 heat transport to prevent frost bulb development, or
15 to very greatly inhibit frost bulb development.

16 MR. ANTHONY: Are you presently
17 conducting studies to determine the effect of in-
18 sulation on the extent to frost bulks.

19 A Studies in the sense of a
20 computer simulation, we don't have a physical model in
21 operation or a test facility.

22 Q But do you also intend to
23 utilize this insulated culvert concept in dealing with
24 the problem we have been discussing?

25 A It is one of the alternatives
26 that we have, yes.

27 Q Mr. Williams, perhaps you
28 can tell me, perhaps this evidence has been before us, I
29 couldn't find it, but could you tell me whether it is the
30 intention at the time of construction across a North Slope

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

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to install these insulated culverts at particular
locations?

WITNESS WILLIAMS: Yes, that
would certainly be the preferable time to do it, at the
time of the insulation of the main pipeline.

Q Could you tell
us at what locations you propose to use that technique?

A No sir, this is a study
that has to be done to, with situations that Dr. McCart
and his crew can indicate that it's important to
maintain the sub-surface float flow.

Q So at this point in time
you can't indicate the nature of the installation, the
places where it would be installed, how often across
the river it would have to be installed, or any of these
guidelines or specifics of the use of that technique?

A I, I don't know of the
specific sites. We can talk in generalities about the
installation Mr. Anthony, if you want. But I can't deal
with a specific site.

Q Let's deal with it then
in that form and deal with, for example, the Firth
River, the Babbage or some other river, could you give
me an indication of what techniques you will^{be} employing
in sites such as those?

Q Well the ditch where the
main pipeline would be constructed first and the pipe
then installed in the ditch, insulated or uninsulated,
probably with concrete coating and weights in addition

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1
2 to insulation, if that's the procedure. The line will
3 be installed fairly deeply because it is a river
4 crossing. You have to take care of possible shifts
5 in channels. I would see a partial backfilling of
6 the pipe then and the ditching then continued then at
7 right angles to the pipe to install the insulated
8 culverts and then followed by backfill.
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Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

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2 Q Dr. McCart, have you had
3 any occasion to conduct any studies or otherwise assess
4 this technique on a river such as the Firth, and whether
5 or not it will work?

6 WITNESS McCART: No.

7 Q You recognize that it
8 may be essential to have some flow in certain parti-
9 cularities. Would you not recommend that such a study
10 or field testing of this technique be conducted before
11 approval of this technique?

12 A No, I'd say that the
13 economical way to approach this is to go -- to locate
14 the areas where there is a possibility of an aquifer
15 sufficiently close to the surface that is feeding a
16 spring in which there are significant populations of
17 aquatic organisms, then to conduct a drilling program
18 to see if in fact these aquifers are as close to the
19 surface as they might be and then I think it may turn
20 out, as a matter of fact, that there are no areas for
21 instance on the North Slope where the aquifers are
22 sufficiently close to the surface to be impinged upon
23 by a pipeline ditch.

24 Q But --

25 A And that is relatively
26 inexpensive to do. If that turns out to be the case
27 then I would recommend that more effort be expended
28 on this thing, possibly including a test or an examina-
29 tion of other alternatives.

30 Q -- in other words, if
it doesn't turn out to be a problem, there's no point

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 in pursuing it.

2 A We are aware that it
3 may be a problem and if it does turn out to be a
4 problem it may be a significant problem from the
5 point of view of fish.

6 Q Dr. Harlan, Mr. Williams
7 suggested that in the crossing of these rivers they
8 may or may not insulate the pipe. Why would you not,
9 as a matter of course, provide further insulation in
10 river courses such as those?

11 WITNESS HARLAN: The necessity
12 for insulating depends on a great number of factors:
13 (1) the temperature of the environment in which you're
14 dealing with.

15 If, for example, it's very
16 warm, insulation probably would be of very little
17 value. So I think it has to be a site specific decision.

18 Q Would you agree with me
19 that such insulation should at least be used in those
20 areas of critical importance where you can't afford to
21 be wrong?

22 A I would agree with you
23 that insulation or another mitigative technique that
24 was shown to work would have to be provided, yes.

25 Q Mr. Hemstock, do you have
26 any plans to conduct the sort of study that Dr. McCart
27 suggests should be conducted, in other words a study
28 of the area to determine if there are -- to locate the
29 aquifers and so on?
30

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 WITNESS HEMSTOCK: We could
2 have plans to check out the, as Dr. McCart suggested,
3 the depth and the quantity of water flowing in aquifers,
4 and he has already done extensive field studies of
5 the location of over-wintering fish populations and
6 you tie that together and you get site specific infor-
7 mation.

8 Q Well, what I'm -- sorry,
9 Dr. Harlan, did you want to --

10 WITNESS HARLAN: Yes, if I may.
11 There is a drilling program and combined geophysical
12 survey planned for this next spring. This is in the
13 area of the Firth and Malcolm Rivers.

14 Q Could you tell me, besides
15 the issues that Dr. McCart has suggested, could you tell
16 me the nature of the studies and what you're looking for
17 and the problems you're attempting to isolate?

18 A Basically we're
19 trying to better define the origin of the springs
20 downstream of the pipeline, to find if, for example, is
21 it a shallow flow system or is it a deep flow system
22 which feeds these springs? We're also trying to get
23 some estimates of groundwater flow velocities, also
24 the temperature of the environment. So it's preliminary
25 information which would be used in the design of
26 mitigative measures.

27 Q Does your study include
28 any field testing of any of these techniques that you
29 suggest might be employed on the North Slope?

30 A We are considering a

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 test insulation of the culvert technique but we haven't
2 reached a decision on this. I think in terms of
3 evaluating the effectiveness of insulation, the
4 theory has been sufficiently well proven that there
5 is no need for a test in this regard.

6 Q Dr. McCart, would you
7 agree with that? The theory of that is sufficiently
8 proven that there would be no need for testing?

9 WITNESS McCART: Well, it's
10 out of my area and I wouldn't care to comment on the
11 theory.

12 Q You will to that extent
13 take their word for it.

14 A Yes. I assume they're
15 at least as expert as I am.

16 Q We will all become
17 experts in everything. Again, I'd like to just
18 touch briefly on a point that was discussed at some
19 length yesterday, and that is the question of the
20 removal of gravel from the active flood plain and as
21 I understand the evidence, the gravel will be put
22 in these windrows in the fall ready for winter con-
23 struction. Dr. McCart, have you made any recommenda-
24 tions as to how this windrowing should be done, whether
25 you should start from downstream and work upstream,
26 or whether you should work from the shore inland, or
27 any other recommendations on the actual use of these
28 sites?

29 A Are you looking at the
30 reconnaissance of the Alyeska Pipeline Report?

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 Q Yes.

2 A I noticed a comment in it
3 somewhere. You may want to check
4 on page 14.

5 A The first paragraph?

6 Q Yes, about line 6.

7 I think that report
8 makes recommendation with respect to the Alyeska line.
9 I'm wondering whether it made the same sort of --

10 A It says that windrows
11 first be constructed on the downstream end
12 proceeding upstream, yes.

13 Q And you're satisfied
14 with that method of proceeding, and would recommend
15 it on the pipeline on the flood plains in the North
16 Slope?

17 A I don't think I would
18 care to comment on that right now. I haven't thought
19 carefully about this particular problem. The
20 suggestion is that it's going to reduce siltation
21 and I think if that is the case then I would agree
22 with it, if in fact that is the likely result of
23 starting at the downstream end.

24 Q That report also
25 suggests that in the Alyeska experience, the construc-
26 tion of these windrows, there was then an accumulation
27 of water, at least to the level of the water table in
28 the area and the problem was raised of what to do
29 with that water. Have you put your mind to that problem
30 and made recommendations?

Harlan, Hemstock, McCart,
Minning, Williams
Cross-Exam by Anthony

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2 A Water remaining in the
3 pits after the removal of the gravel.

4 Q Dealing now yes, with the
5 time actually when the pit is first open and the windrows
6 of gravel are established and I guess in particular in
7 a situation where the mine has gone below the water
8 level in the area.

9 A I am not ^{so}/sure it is a
10 problem from my point of view. It may be a problem from
11 the point of view of the operation of equipment and things
12 like that.

13 Q The problem you would
14 see would be the fact that with water in there it may
15 be difficult if not impossible for the tractors to
16 continue their operation in some depth of water?

17 A Yes. As I say, I don't
18 see there is a problem from my point of view, the fact
19 that there is water in pits enclosed by a berm inaccessible
20 to fish.

21 Q Well, Mr. Williams would
22 you agree that it would be fairly difficult, if not
23 impossible, for the cats to continue their borrow pit
24 operations in a number of feet of water?

25 WITNESS WILLIAMS: A If it
26 got over two to three feet, it would be--tractors would
27 have quite a bit of difficulty, yes.

28 Q And, what would you do
29 with the water then to ensure you can continue your
30 borrow operations?

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

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2 A I really can't see this
3 being a problem, Mr. Anthony. If you have got a bar
4 that is substantially above the water level in the
5 streams, you scalp some off the top and make the berms
6 around the area that you are going to take gravel from.
7 I would see that when that is done, the top of the
8 pit is still substantially above the level of water in the
9 streams. Then you, with the tractors, start windrowing
10 the material until you have got enough pushed up into
11 winrows. This may be before you hit the water level.
12 It may be your tractors are working in a couple feet of
13 water. When you have accomplished that, that is it.
14 Shut it down and wait until you need it in the wintertime.

15 And in the wintertime,
16 when you go to take that gravel from the windrow the
17 water that has accumulated on the side, of course, is
18 going to be frozen.

19 WITNESS McCART: Could I comment
20 that with the timing of these operations, the suggested
21 time that the water table is going to be dropping con-
22 tinuously throughout the period of gravel removal and
23 in addition to that in some locations, the flow will
24 cease entirely so that the problem which may be apparent
25 early on might be no problem at all a few weeks later.

26 Q I don't want to discuss
27 the question where there is no problem. I would like to
28 now zero in on a situation where in fact your windrow
29 construction has resulted in the tractors operating a
30 level a number of feet below the water level in that

Harlan, Hemstock, McCart,
Minning, Williams
Cross-Exam by Anthony

1 particular area. And therefore, through the natural
2 seepage in that area the pit fills up with water and
3 that certainly is what happened in Alaska, Dr. McCart,
4 is that not right?
5

6 A Yes, not necessarily with
7 any environmental consequences as I said.

8 Q Well, we can--let's go
9 on to that point then. So, we have a situation where
10 these pits have accumulated water. Now, Dr. McCart,
11 you have indicated to me that as long as it stays in the
12 berm you don't have any problem with it and Mr. Williams,
13 you suggested that if there is a number of feet of water
14 it could seriously impede the use of the tractors in
15 that water. Now, can we take those two statements and
16 deal with that? When you have a situation where your
17 tractors are unable to operate in a borrow pit because
18 of the depth of the water. What do you propose with
19 the water, then, Mr. Williams?

20 WITNESS WILLIAMS: A How did
21 the water get--how many feet of water are you talking
22 about? How did it get there?

23 Q Well, Mr. Williams, I think
24 that--I thought that yesterday we had established that
25 you are in active flood plain and you are now mining
26 gravel at some distance below the water table in that
27 area, that through natural seepage, water is going to
28 fill into that, fill up that hole. Now, I thought--

29 A A couple of feet.

30 Q Okay, now --

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Minning, Williams
Cross-Exam by Anthony

A It is not the plan to
put in draglines or backhoes to excavate deeper than
that.

Q So your recommendation is
then that in all cases you do not mine to any greater
level than you can operate your cats, in that -- That is
not a very good question. Perhaps, let me rephrase
that. Is your recommendation then that mining
operations not take place to a greater depth than one
or two feet below the water table?

A Yes.

Q You say that because
anything lower would--the cats couldn't operate in that
depth of water?

A I would see that water
level in the pits being very similar to the water level
in the adjacent streams. It is all gravel. I can't
see it being otherwise for a very long period of time.

Q Okay, but --

A It is going to equalize.

Q That is right. That is
precisely the point I am making and I am suggesting to
you that your cat cannot operate in six or seven feet
of water obviously.

A You are right.

Q Right. So, obviously too,
then, if the water is going to fill up into that pit to
the height of the water table in the rest of the stream
your pit can't be any deeper than the height that your

Harlan, Hemstock, McCart,
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Cross-Exam by Anthony

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tractors can tolerate.

A Well, you have either
picked a bum site and you should fire your engineer or
you have had a heavy storm and the water level has come
up and Dr. McCart just said that the time of the year
that we are working in there that is not liable to
happen.

Q If it does happen and we
don't have the last evidence here. Let me deal with
that because it has happened in other locations.
Perhaps you can take my word for it at this point in
time. What do you propose to do with that water then?

WITNESS HARLAN:

A I think it is a question,
if the water does come up due to the storm, then you
just discontinue operations until the water recedes.

Q That would be a recommen-
dation? Would you ever recommend any pumping out of the
pit in order that your operations can continue?

A I can't see that it is
a very productive exercise.

Q So you would not recommend
that that technique ever be used--the pumping out of
any borrow pit operation?

A That is correct. Yes.

Q Dr. McCart, if you had
the situation with the water flowing in to that area
as a result of a storm or a breach in the berm, would
you expect that fish might get into that borrow pit
area?

Harlan, Hemstock, McCart,
Minning, Williams
Cross-Exam by Anthony

WITNESS McCART: A Well,
they might. Definitely...

Q And if that takes place,
is there any way you can protect the fish in that regard
or can you breach the berm and allow the water to run
out or how do you deal with that problem?

A Well, in a situation like
that, the best idea would be to open the berm at both
ends if there were a significant number of fish in there.

It is very unlikely, for
instance, that you are going to get a massive migration
of, let's say, Arctic char moving upstream moving into
a gravel pit as a result of a breach or something like
this. There may be some juvenile or young of the
year that become entrapped in there.

Q I understand that, in answer
to a question yesterday, that the intention is to restore
the gravel pits in the fall, autumn, or late--early
winter, Dr. McCart?

WITNESS WILLIAMS: A No,
I would think it would be late winter, Mr. Anthony, after
you have taken the gravel out that has been windrowed
Are we still talking about flood plain--active flood
plain borrow sites?

Q Yes.

A Yes.

Q So they would then be
restored following the end of construction season and
prior to the spring?

Harlan, Hemstock, McCart,
Minning, Williams
Cross-Exam by Anthony

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A Yes, sir.

Q And your construction
schedule has provided time for this activity to take
place in each instance?

A Yes.

Q It is the intention, Mr.
Williams, to use ice bridges for any river crossings?

A Yes.

Q And have you provided any
guidelines, or Dr. McCart, any guidelines on the method
of construction or the use of this technique?

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

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2 WITNESS WILLIAMS: I don't
3 know if we've had any discussions. I think we have
4 chatted about it from time to time, but I've forgotten
5 the details.

6 WITNESS HEMSTOCK:
7 We have some recommenda-
8 tions in one of our reports included in Volume 15 of
9 the Biological Report series, a report by McCart &
10 DeGraff, where we comment on ice bridges, winter
11 bridges along the Mackenzie Valley.

12 Q Mr. Hemstock, have you
13 considered those recommendations and has Arctic Gas
14 accepted these?

15 WITNESS HEMSTOCK: Those kind
16 of recommendations are also part of the land use
17 regulations and we would follow those recommendations.

18 Q And it is then your
19 intention to follow ^{the} recommendations of Dr. McCart as
20 he outlined in his report to you?

21 A Yes. ,

22 Q I'm afraid, Dr. McCart,
23 I don't have that volume with me, but could you tell me
24 whether it makes any comment with respect to the use
25 of materials other than snow and ice for use on
26 ice bridges?

27 WITNESS MCCART: I'd comment that
28 no materials other than snow and ice should be used,
29 I think.

30 Q Thank you.

A We have a few horror
photographs in there showing other kinds of construction,

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 and commenting negatively on there.

2 Q Now the Environmental
3 Protection Board in its review came up with a formula
4 for the weight and the amount of traffic over ice
5 bridges and they dealt with the question of residents
6 of traffic and the effect on fish. Have you studied
7 this part of their report, Dr. McCart, and do you have
8 any comments on the suggested criteria for the use of
9 ice bridges?

10 A No, I haven't any at the
11 moment. I think that's maybe that's more of an engineer-
12 ing problem.

13 Q Mr. Williams, have you
14 examined their recommendations in that regard?

15 WITNESS WILLIAMS: I have read
16 it. It's some time ago and the details escape me now.

17 Q Well, I won't even attempt
18 the details since it basically involves a formula where
19 one figure is the amount of weight and the next figure is
20 the amount of thickness of the ice in inches and so on.
21 But you haven't conducted any similar studies to
22 determine the design criteria for the use of ice
23 bridges?

24 A There has been a fair bit
25 of research done in this area by several people. A lot
26 of done in the James Bay project, I've read some of
27 that material.

28 WITNESS HEMSTOCK: I published
29 on the thickness of ice and the allowable loads on it

30 WITNESS WILLIAMS: I've read Mr.

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 Hemstock's paper on it.

2 Q And how does your re-
3 search then compare with the Environmental Protection
4 Board's conclusions?

5 WITNESS HEMSTOCK: I'm sorry,
6 I can't recall what they said.

7 Q I could give you the
8 formula, but I don't think that would help either, but
9 I don't think that would help either.

10 A Well, the formula is at
11 best only an indication. There are a lot of other
12 factors that have to be included in there, such things
13 as the speed of the vehicle, the kind of ice, the number
14 of cracks per meter, all of those things have to be
15 put into it, so any simple formula would just tend to
16 be misleading. It's a general thing, that's all.

17 Q I wonder if your counsel
18 advise me at
19 could / some subsequent time advise me of the published
20 report that you have done, in order that we can review
21 that and perhaps compare the --

22 A I don't remember the
23 title, but we can get you a copy.

24 Q Thank you. I think in
25 an answer to an earlier question this morning, Mr.
26 Williams, you commented in trying to eradicate my
27 confusion over Mr. Scott's and your dialogue, or mutual
28 monologue yesterday, dealing with the question of
29 river crossings and siltation do I understand your
30 position is that there are very few, if any, stream
crossings where siltation at the actual river crossing

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 is a potential problem?

2 WITNESS WILLIAMS: No, I
3 don't think so, Mr. Anthony. These streams have
4 flowing water in them and a ditch is excavated,
5 there is going to be some resulting siltation from
6 the work of excavated material and backfilling.

7 Q Have you identified any
8 particular streams that would require special remedial
9 techniques?

10 A We're talking about the
11 stream itself?

12 Q Dealing with the river
13 crossings itself?

14 A The rivers themselves rather
15 than the -- No I think we have discussed it with -- I
16 remember discussing it on more than one occasion with
17 Dr. McCart and I think the critical streams maybe are
18 the small ones. They would be done when there is a
19 fair thickness of ice over the stream. The spoil
20 would be first of all the ice in the immediate vicinity
21 of the ditch would be broken and the spoil placed on
22 the ice downstream of the excavation. If there is
23 water flowing in it, of course and we're talking about
24 in this case small streams, it would be done in the
25 shortest time possible so that things don't freeze up
26 before the pipe is installed and backfilled. But yes,
27 there will in those cases there will be some siltation.

28 Q I was wondering whether
29 you have, in your research, identified streams that
30 are particularly sensitive to this problem that we've
discussed.

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 A I haven't; perhaps
2 Dr. McCart has.

3 WITNESS MCCART: There's a
4 comment on almost every stream along the alignment, on the
5 sheets, and if there is a particular concern we've
6 indicated it.

7 Q What are the character-
8 istics, which in your mind, Dr. McCart, make a stream
9 particularly sensitive? I'm not dealing now with because
10 there are fish there, but ^{I mean what are the} conditions as far as the
11 terrain around the streams, or at the stream crossing
12 that particularly alert you?

13 A Well, of course, our
14 major concern is sedimentation in any stream, where there
15 might be spawning, so that we're concerned about
16 any situation where the terrain would present
17 difficulties in stabilization; but I might add so are
18 the engineers concerned about these areas to the
19 exclusion of other -- not the exclusion, but to a
20 greater extent in that area because of the problem of
21 pipeline integrity.

22 Q Have you made any
23 recommendations with respect to the use of weirs or
24 coffer dams or settlement basins at any of these
25 locations?

26 A We haven't specifically
27 mentioned that, as I remember, but we were out -- or
28 at least I was with several other environmental people
29 out looking at the Sarnia to Montreal Pipeline,
30 and looking at the techniques they were using there

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 which included culverting stream crossings and putting
2 in successive sand-bagging, a series of settling basins
3 and we would certainly recommend that this technique
4 be used. I understand^{that} it's also used on the Alyeska
5 haul road in certain circumstances.

6 Q Sorry, I didn't quite
7 get that. Did you say you had recommended this technique
8 be used?

9 A We will be, yes.
10 Verbally I've communicated this to, I think Mr.
11 Hemstock.

12 Q Dr. McCart, I believe in
13 an answer to a question of mine a few days ago you
14 suggested that as a matter of general principle you
15 have recommended that the use of upland gravel sources
16 rather than active flood plain sources, is that right?

17 A What I was saying was
18 that as a fisheries' biologist we have a bias against
19 placing gravel pits in flood plains. However, I think
20 that in circumstances where one can define the potential
21 for environmental damage, where we have a detailed
22 working plan and we have a detailed environmental
23 impact assessment, that it is possible to establish
24 gravel pits in flood plains without incurring any
25 significant environmental damage. For instance in the
26 Malcolm-Firth areas, downstream of the pipeline, as I
27 pointed out I think yesterday, there are 60 square miles
28 or so of active flood plains. These are relatively small
29 rivers, which on any particular occasion occupy^{only} a very
30 tiny proportion of that total area which one could consider

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Anthony

1 active flood plain, because in any one year it is liable to
2 be flooded and in ^{that} these circumstances surely we can
3 find a place in here where it is most unlikely that any
4 significant environmental damage will occur.

5 Q Well, I'm merely trying
6 now to draw on your knowledge of the Alyeska experience
7 as well as your ^{obvious} great knowledge of the North Slope in
8 Canada. I understand -- and please correct me if I'm
9 wrong -- that as a general guideline in the Alyeska
10 project the recommendations of the fish biologists in
11 particular were that the active flood plains not be
12 used if there were upland sources available.

13 A As I recall it, in the
14 early days Alyeska themselves stated that they would
15 only remove gravel from fossil flood plains. Now
16 obviously since that time there has been a change in
17 their thinking and I'm not certain what went on, be-
18 cause it appears now that almost all of their -- well,
19 a large proportion of their gravel pits or borrow
20 sources are in fact in the active channel of the
21 Sagavanirtoke River.

22 Q Can you --

23 A I am not aware, inciden-
24 tally, that this has resulted in any, or anyone has
25 identified any situations in which it has resulted in
26 damage to fish populations in the river.

27 Q On the basis of your
28 knowledge of that project, do you know how that decision
29 was made or why the decision was made?

30 A No, I don't know what
occurred.

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

1
2 Q I would like to ask a
3 question now dealing with water consumption and water
4 use and I believe that this is covered generally on
5 page 43 of your prepared evidence. There is the last
6 sentence of the first paragraph on that page, you state
7 "Arctic Gas is aware that in several areas on the
8 proposed route it will be necessary to avoid withdrawing
9 water from sensitive areas or if a water source is
10 developed in those areas a minimum flow level must be
11 maintained to protect the downstream fish populations."
12 I can deal with the first part of that sentence Dr.
13 McCart and if you could assist us by indicating what
14 you mean by, "avoid ^{withdrawing} / water from sensitive
15 areas," What are the sensitive areas you are referring
16 to?

17 A These would
18 be areas in which there was a significant population
19 of some aquatic organism that we were concerned about.

20 Q This would be both fish
21 and food that fish may only rely on?

22 A Basically fish, yes.
23 Although we wouldn't want to affect benthic and burbot
24 populations because of course if there were fish in the
25 area, there might be some secondary effect on fish. I
26 should point out also that some of these areas are
27 utilized by birds at one time or another, so that if
28 you affect the populations of benthic and burbot
29 they are not going to be in a position to, well they
30 won't do as well because there won't be any food/^{there}for

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

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them if that is what they are dependent on.

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Q And I would assume that to
define a sensitive area you would also have to have a
pretty good indication of the fishing and spawning
potential of these water bodies?

7

8

A I wouldn't say, fishing
potential? You mean potential for fish?

9

10

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Q Potential for fish.
A Oh, yes, yes we would have
to have some indication of whether the fish were
abundant in the area or sparse and whether or not they
were utilizing it for spawning and what aspects of their
life history were being carried out in that particular
area.

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Q Have you been doing such
studies along the route to the Mackenzie River?

A Yes.

Q And the identification of
these sensitive areas are those outlined in the
biological report series and reports to Arctic Gas?

A We indicate sensitivity on
the alignment sheets. Now, of course, we are continuing
to coalite information that other people are gathering
because there is a great of activity in the Mackenzie
Valley and we are continuing studies in certain areas
ourselves. We don't pretend to have identified every
possible sensitive area but we feel that we have a broad
overall knowledge of this.

Q You also indicate in that

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

1
2 statement of evidence that if use of water in these
3 areas is to be proceeded with ^{that} / a minimum flow level
4 must be maintained. perhaps you/ ^{could} define that a little more
5 fully for me?

6 A Well certainly a minimum
7 flow level would be a level which would not cause any
8 significant damage to fish populations.

9 Q And this would have to
10 be determined at each location at--

11 A Yes.

12 Q At this specific time of
13 the use in that area?

14 A That's right.

15 Q And therefore it would
16 require someone such as yourself on site at each time
17 the water use was to be extracted out?

18 A I think what we have planned
19 to do, as a matter of fact, we have a water availability
20 study under way and we are trying to identify the volumes
21 of water in lakes, for instance. Now our major concern is
22 with the North Slope, I think rather than the Mackenzie
23 Valley because in the Mackenzie Valley in many long,
24 long stretches of the pipeline you always have the
25 option of going to the Mackenzie River for water, so
26 that we have concentrated our work to date on the North
27 Slope, including both the Canadian and the American
28 sides and we are interested in knowing what the volumes
29 of lakes are along the route of the pipeline and the
30 potential sources of water, which may be in the form of

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

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2 springs and things of this nature.

3 Q Well, in your response
4 to the pipeline application, assessment group **question**
5 52, you outlined there, for example, the lakes that you
6 intend to use to draw water from and also how much
7 water you expect would be drawn from each location.
8 But to do an enviromental impact assessment, do you not
9 also have to know how much the level of that lake will
10 go down as a result of this withdrawal?

11 A Yes, we do and in fact this
12 was just, I think, an example of the thinking as far as
13 water availability and water requirements goes rather
14 than a final plan. Certainly we have a lot more in-
15 formation than that at this point. We have better volume
16 estimates for some of the springs and we have a lot
17 more information on volumes in some of the lakes along
18 that pipeline route.

19 Q Well, dealing then with the
20 lakes that you have identified in your answer to the
21 pipeline application assessment group, are you able to
22 indicate now the amount that the lakes will go down, or
23 the rivers will narrow too, as a result of the water
24 use you propose?

25 A No. I don't think we are
26 at that point. I think we are at the point where we
27 still are trying to identify potential sources. Let me
28 point out that the lakes that are included on here, are
29 included simply because they happen to be ones where we
30

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

1
2 were conducting fish studies and they happen to be ones
3 for which we had depth data and we could calculate
4 volumes and as I say, this is simply an example of the
5 sort of approach that would be taken. Now, these are
6 not necessary, necessarily the lakes that will be
7 utilized if water is to be withdrawn at all from lakes
8 and, as I say, we have examined a further twenty or
9 I think
thirty/this summer. We are trying to get some information
10 on depths, volumes, presense and absense of various fish
11 species, water chemistry, water chemistry, water quality
12 characteristics of / these lakes and things of that nature
13 and we certainly will, before I think any water with-
14 drawal takes place, be able to present information on
15 what the period of withdrawal would be, what the draw
16 down would be, I think what area of the lake might, what
17 areas might be affected, the shallower areas and things
18 of this sort in each of these instances and with an
19 assessment of what the potential affect on aquatic
20 organisms might be.

21 Q Now that, the nature of that
22 study and the information that you have outlined is done,
23 then
Mr. Hemstock, is it the intention/of Arctic Gas to
24 conduct such a study and get all this information before
25 approving / the
the withdrawal of water from any particular
26 location?

27 WITNESS HEMSTOCK: Yes.

28 Q Dr. McCart, in dealing with
29 the withdrawal and use of water, whether as sewage
30 treatment, or as water supply for construction camps, have

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Anthony

1
2 you made any recommendations as to the size or rivers
3 or streams that should be used at any particular
4 location?

5 WITNESS McCART: The water
6 withdrawal?

7 Q Yes.

8 A Well no I haven't but as I
9 say, we are getting that kind of information so if it
10 is of any use we will be able to give the information
11 on discharges, particularly from springs but also from
12 some of the springs along the pipeline right-of-way.

13 Q Would you agree, as a
14 general guideline, that camps should not be located in
15 the vicinity of, or should be located in the vicinities
16 of larger streams or lakes as compared with smaller
17 water courses?

18 A No, I wouldn't say that,
19 because it is very likely that a lot of small lakes
20 and water bodies are of no particular importance, it
21 seems to me, to fish. Now I have gone biased of course.
22 In many instances these lakes don't have fish populations
23 in them. However, some of the shallower water bodies
24 which might^{be}/void of fish may be important for birds
25 and things of this sort. So, we have got to make some
26 sort of assessment, overall assessment here.

27 Q I don't have the exact
28 figure here and perhaps you could help me, Dr. McCart,
29 but I understand that Dr. Brunskill in his enviromental
30 social program, volume 73-40, at page 84, which I

Harlan, Hemstock, McCart,
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Cross-Exam by Anthony

1
2 thought I had with me and I apologize for not, but I
3 believe he says in his report there, that camps should
4 not be located in the vicinity of streams with less
5 water flow than .5 cubic metres per second, or a certain
6 particular minimum flow. Have you done any similar
7 consideration and come to any conclusion as to the
8 location of camp sites and the water flow in the area?

9 A No, I haven't. I think
10 again it is a site specific consideration. I don't like
11 this kind of quantitative approach to this because it
12 may be very well in the Mackenzie to say that this is
13 so, but it may be a quite different situation on the
14 North Slope and I would like to know what time of the
15 year are we measuring this, because there are all sorts
16 of what could be classified as a set, excuse me, ephemeral
17 streams on the North Slope that run in the spring simply
18 because there is no water penetration prior to the time
19 of melt and we may have rather considerable streams
20 which are, only carry a flow for a very, very limited
21 period of time. On one occasion I know we set up a
22 fish weir on a stream, which had a nice flow in early
23 June and, of course, no fish appeared because the thing
24 dried up a week or so later.

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Cross-Exam by Anthony

1 Q I will agree with you
2 in the method of analysis, but are you therefore doing
3 a site specific evaluation of the location of camps?

4 A We will, yes.

5 Q Sorry, I missed that.

6 A We will, yes. We have
7 not yet done it but we will do it during the final
8 design stage, if I can use that phrase. We will look
9 in detail at camps and make recommendations.

10 Q And Dr. Hemstock, you
11 would then agree that this type of on-site evaluation
12 of sites must be completed before the location of
13 camps is determined?

14 A Yes.

15 Q And that means in your
16 current plans then that the location of camps will not
17 be determined until final design?

18 A These aspects will have
19 to be examined. This is certainly not the controlling
20 factor. There are all sorts of other factors have to
21 be brought in here, and one of the most important ones
22 of course, is that there'd^{be}a great pressure to use the
23 proposed
/compressor stations sites as the construction sites.
24 Those don't have a great deal of -- we can't bury those
25 too much, but obviously the source and availability of
26 water is an important factor.

27 Q What other environmental
28 factors? I recognize that there may be some engineering
29 and logistics considerations, but what other environmen-
30 tal factors should go into the decision as to the

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Cross-Exam by Anthony

1 location of the camp?

2 A Well, the impact on
3 wildlife in some cases is quite important. Obviously
4 there is socio-economic concerns at location campsites.

5 Q Well, we'll get into an
6 examination of those types in subsequent stages, but
7 from the terrain of the physical environment point of
8 view there is the presence of water has been one
9 isolated characteristic. Now, Dr. McCart, Mr. Hemstock
10 has indicated that location of camps at compressor
11 sites is a given, are you now examining the effect of
12 those sites on the water in the vicinity?

13 WITNESS MCCART: I didn't
14 understand you to say it was a given--It may be very
15 close to that, but he didn't quite state it that way.

16 Q Well, perhaps I should be
17 fair --

18 A It's a very, very major
19 consideration. We have commented on each of the
20 compressor sites as they're shown on the alignment
21 sheets at some point and indicated where we thought
22 that there should be adjustments in the location of
23 compressor sites, and certainly on parts of the route
24 there have been minor adjustments in compressor
25 site stations in response, I think, to environmental
26 concerns. I can think of an occasion or two of specific-
27 ally on the Alaskan side, now these are not major
28 changes, because there are engineering constraints on the
29 location of these. However, we have commented on them,
30 yes.

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Cross-Exam by Anthony

1 Q But these comments on the
2 location of compressor sites, do they include recommen-
3 dations dealing with -- or comments relating to the
4 use of these sites as camps, or are they dealing solely
5 with the fact of drainage, and you know, other con-
6 siderations?

7 A We were certainly aware
8 of the fact that they were likely also to be campsites.
9 So that we would have included that in our assessment.

10 Q Could you tell me where
11 your recommendations are of the studies that you've
12 done of various sites?

13 A No, I couldn't. I know
14 that they were put on paper at one point but where they
15 are, I don't know.

16 Q Mr. Hemstock, do you
17 know where these studies of compressor station sites
18 and water-related problems are and whether they can
19 be made available?

20 WITNESS HEMSTOCK: I would have
21 to check. I'm not sure that they're in any report form
22 at all. They may be simply in memorandum stage. I
23 can't recall.

24 WITNESS McCART: Well, I'm almost
25 certain they were in fact only in a memorandum stage.
26 They do not constitute a report and certainly
27 they do not constitute from my point of view a final
28 statement on these things, from the point of view of
29 water and fish.
30

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Cross-Exam by Anthony

1 Q Well, since you are here
2 now, could you ^{either} now, or in preparation of your evidence
3 for Phase 3, give us an indication of the research you
4 have done to date and your conclusions as they are
5 at present?

6 A Well, I wouldn't say that
7 we've actually done research. We have made comments on
8 these things and our intention is, if and when the
9 compressor site stations and the camp locations are
10 finalized, we get a better indication, we will go in
11 and look at these things in more detail.

12 Q Yes, well you have at
13 least to this stage examined these compressor sites
14 and made certain comments whether in the memorandum
15 form or official report form and I'm wondering if
16 we could have the benefit of those comments in order
17 that we might discuss it and perhaps --

18 A If they're in my files
19 I'll endeavor to locate them.

20 Q Well, perhaps in fairness
21 to you and to Mr. Marshall, I can say I would hope
22 to be able to discuss and comment further on this
23 issue and perhaps you could take the occasion/ ^{between} now
24 and your ^{return in} Phase 3 to examine your evidence and your
25 comments and recommendations along these?

26 A I might comment myself
27 that of course our recommendations at that time had
28 to be made on the basis of what information we had
29 available.

30 Q Certainly, and I would

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1 hope that you would update.

2 A Of course, this level of
3 information is not that great, so they are not comments
4 based on on-site examination in detail. We have gone
5 back into some of these areas and done some work since.

6 Q Well certainly I didn't
7 want to tie you to anything you had written at any
8 particular stage. I'd like you to give us the benefit
9 of your advice and opinion as of the time that you appear
10 before us, and if you've updated and changed your
11 mind, or done further research we'd be pleased to hear
12 of that also.

13 M R MARSHALL: Mr. Anthony, I
14 wonder if there would be a way that Dr. McCart could
15 go about this that would be most productive from your
16 point of view and ours? He's indicated that he's made
17 comments, I gather in some memoranda form, based on
18 some preliminary information, and he's commented that
19 this material is not really all up-to-date and wouldn't
20 represent necessarily his current thinking. Would it
21 be more helpful to have him deal with representative
22 stations and give you his assessment, perhaps based on
23 on-site visits?

24 MR. ANTHONY: I think what I'm
25 interested in, in pursuing this, is to determine what
26 sort of examination Dr. McCart , for example, feels
27 should be conducted to answer these sorts of questions
28 of the impact; secondly, what work has been done and
29 what conclusions he's come to, if any, and what recommen-
30 dations he wishes to make as to specific sites, for

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1 example, or just generally the type of considerations
2 and guidelines that are to be taken into consideration
3 in evaluating the environmental impact of a compressor
4 station work-camp setting.

5 MR. MARSHALL: Well, I think
6 Dr. McCart could probably tell you what factors he
7 thinks ought to be taken into account and what sort of
8 an assessment ought to be made with respect to his
9 discipline. He could probably give that to you now,
10 if it would be of some assistance.

11 MR. ANTHONY: Well, I would
12 hope to pursue that a little farther by asking him
13 for particular comments, in particular situations and
14 I thought that if he wished to look back at work that
15 he had done before before pursuing that in any detail and
16 rather than fractionalize it, maybe in fairness to him,
17 we should allow him to refresh his memory and then we
18 can talk about it at his re-attendance, If that's
19 suitable to you, Dr. McCart?

20 WITNESS MCCART: Well, I
21 would be prepared to comment on guidelines, if you
22 are interested and I would be prepared to comment
23 on particular compressor sites if you wish to designate
24 a few at this time.

25 Q Sir, would you -- you
26 mean at this time or do you wish to consider it?

27 A If you want to bring
28 out an alignment sheet and point to a particular
29 compressor site, I would maybe be prepared to make
30 some comments about it, not the sort of comments that

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Cross-Exam by Anthony

1 I might make if I were on the scene and had done a
2 very, very detailed sort of examination.

3 Q Mr. Commissioner, in an
4 attempt to come to a realistic appraisal of the issue
5 I've been assisted by Mr. Bayly in this regard and
6 we think perhaps the easiest way would be to allow
7 Mr. Bayly to deal with the specific sites that he
8 has in mind of particular concern to him, and we can
9 deal with the particular in that case on a more
10 general plain. I would like to however, get an indica-
11 tion of the sort of guidelines and questions you have
12 raised, either in the research you've done or in your
13 thinking to date relating to the question of the location
14 of campsites and compressor sites.

15 A Well, again we're concerned
16 about critical areas and we would be very concerned if
17 it appeared that the camp might in some way affect the
18 well-being of populations, particularly of fish, from
19 my point of view, so that we're concerned about the
20 likelihood (a) that -- let me go back -- we would be
21 concerned about such things as water availability
22 there water available in the area, in the immediate
23 vicinity, or will it be necessary to build an access
24 road? If you build an access road, is this access road
25 going to have to parallel the bed of the stream? If so
26 we would be somewhat more concerned than if the access
27 road were crossing streams at right angles. If the
28 access road is a permanent road, will it be necessary
29 for culverting along the course of that access road?
30 This would apply to any access road, either to a water

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1 source or to gravel pits in the area. We're concerned
2 about culverts, of course, particularly where we have
3 upstream migrations of fish which might be impeded
4 by the construction of a culvert. We would be concerned
5 that there be no sedimentation of natural waters, whether
6 be lakes or streams where this might affect populations
7 of fish. We would be concerned if there was sedimenta-
8 tion -- or excuse me, eutrophication . or enrichment of
9 -- through some means, either by the presence of
10 domestic sewage or through let's say the release of
11 or leakage from fertilizer which had been improperly
12 stored. These are all concerns of ours. We would be
13 concerned about the possibility that toxic chemicals
14 stored on the site might escape into bodies of water,
15 thus affecting populations of aquatic organisms. We
16 have made recommendations, I might add, in all of
17 these instances.

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1 We would be concerned
2 about fishing by construction personnel. If they were
3 able to fish in bodies of water in the vicinity to
4 the extent that they might affect, seriously affect the
5 population. And we know that this can happen in the
6 north and it has happened in lakes as large as Great
7 Bear Lake. Certainly it can happen in a much smaller
8 situation if there were large numbers of men fishing in
9 a very limited area. These are all ^{the} kinds of concerns
10 that we have and we would comment on these -- comment
11 on their likelihood and also suggest ^{mitigative} measures
12 in each of these instances.

13 Q Well, you have provided
14 a very comprehensive list. It seemed to cover the
15 point I had and more. Could you tell me now what
16 recommendations you made with respect to these particular
17 problems?

18 A We have made recommendation
19 of course, all through our reports--many of which relate
20 to this particular question.

21 Q Could you tell me the
22 whether you have provided any comprehensive list of
23 recommendations or are you referring now to your studies
24 in the Biological Report series?

25 A Well now, for instance,
26 in one of the papers in the Biological Report series
27 there is a list of recommendations with respect to
28 lakes and with respect particularly to the problem
29 of eutrophication and oxygen depletion. We have made a
30

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1 fairly considerable list in the discussion of this. I
2 think it is --/Q: I can find the chapter if you would like.
3 It is chapter 6, Volume 15 "Preliminary Studies of
4 Primary Productivity and Other Aspects of Lineology."
5

6 A There is a list of
7 recommendations there particularly with respect to
8 activities in the vicinity of lakes. And I think we--
9 it was written quite a while ago but I think we speci-
10 fically comment on camps and things of this nature.

11 Q Those recommendations in
12 this volume, Mr. Hemstock, are they^{accepted} by Arctic
13 Gas and would propose to proceed on the basis of those?

14 WITNESS HEMSTOCK: A Yes.
15 Again I would have to point out though that in some
16 cases a recommendation from Dr. McCart might be contrary
17 to recommendations from some of the other biologists
18 because of other factors and you have to then balance
19 those pros and cons out and make some sort of a decision.
20 But certainly we are aware of Dr. McCart's concerns and
21 I think in almost every case, we can accept them as
22 written and there is no concern.

23 Q And the recommendations
24 that he has referred to therefore, would only be breached
25 in the-- if there was another environmental concern
26 that would offset the recommendation he has made?

27 A Yes. And we have been
28 discussing a typical one -- the business of gravel
29 pits. If he would like to see them off the active flood
30 plains or that is his general and first approach.

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Obviously the mammal and bird people would not. They would prefer to not have an upland site used. So if an active flood plain site is selected then it is selected and the recommendations of Dr. McCart to mitigate the impact on fish populations are followed and we believe that there would be very little impact-- environmental impact as a result of that choice.

Q Dr. McCart, could assist me by directing me to any other source of recommendations that have covered the enumerations that you have provided -- the enumeration of concerns?

WITNESS MCCART: I think there are a fair number of them included in this application. We have indicated our concerns there. These are all general concerns in the sense that not all of them specifically apply to construction sites. ~~The same~~ sorts of things that apply to construction sites apply in lots of other circumstances --culverting, you may expect that there may be a few culverts along the pipeline right-of-way. And they may not be related to construction sites and we certainly have commented on this. I think that the engineers got tired of hearing about culverts and they pointed to me that there are only five planned apparently along the Mackenzie portion of the route so that possibly it is not a big deal with respect to this particular pipeline.

Q I am sorry you ended up with that note because I was just about to ask what recommend-

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1
2 ations you had made with respect to the use of culverts
3 and perhaps ^{with} the fear of boring Mr. Williams, could
4 outline your recommendations with respect to the
5 stream crossings by permanent roads and the use of
6 culverting?

WITNESS WILLIAMS:

7 A Some of the restrictions
8 that Dr. McCart has put on with respect to culverts, I
9 would see it probably more economical to go to Bailey
10 bridges. It is that bad.

11 Q Well, is the intention
12 then to go to these bridges or are you still proposing
13 to use culverts on these permanent access roads?

14 A It is, each case has to
15 be assessed, Mr. Anthony, but in some cases to take care
16 of peak floods and stay within the velocities that Dr.
17 McCart is talking about -- I didn't mean to appear light
18 but -- Yes, I would recommend Bailey bridges in some
19 situations.

20 Q Thank you. Dr. McCart,
21 have you made recommendations as to the time of the
22 Year that these culverts had been installed?

23 WITNESS MCCART: A I don't
24 know that I specifically commented on this with respect
25 to culverts. Of course, I think that we would be
26 partial to constructing at a time when there is going
27 to be minimal sedimentation as a general guideline --
28 minimal increase in sedimentation. To tell you the
29 truth, it would ^{probably} be preferable if they were placed in
30 during the spring flood because this is the time when

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1
2 the incremental effect of the placement of the culvert is
3 going to be leased. Unfortunately, this is also the
4 time of the year when it is most difficult to do this
5 from a construction point of view. So that this isn't
6 a very realistic assessment.

7 The culverts will only be
8 placed on small streams and almost without exception
9 these are streams which are frozen to the bottom in
10 winter so our recommendation would be that in general
11 that is the best time.

12 There are, incidentally,
13 mitigative measures that can be taken including the use
14 of settling basins and things of this nature if they
15 had to be placed in at another time when there is some
16 flow to restrict any downstream sedimentation.

17 Q Would it also include the
18 use of water diversion around the construction area?

19 A Yes, this is apparently
20 the technique that is being used by Alyeska.

21 Q And do you have any
22 comment on the use of that technique?

23 A Yes, I watched a similar
24 technique being used to bridge a small stream with a
25 temporary road in Ontario a couple of weeks ago and I
26 was quite impressed with the result. I think I mentioned
27 this shortly before this.

28 Q Have you made any recommend-
29 ations as to culvert depth and its effect on stream
30 bed deposits?

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Cross-Exam by Anthony

1
2 A Its effect on stream bed
3 what?

4 Q Deposits. / ^{I'm dealing now with} the ability
5 of the stream on installation of the culvert to either
6 clog up the culvert with the deposits in the bottom of
7 the stream or and any other recommendations dealing with
8 the ^{installation and} use of culverts on streams.

9 A Well, we don't want the
10 culvert plugged up if there is enough stream migration
11 of fish, of course.

12 Q I am with you there. Any
13 recommendation as to depth, size, velocity that is
14 through culverts or any of these fishes?

15 A Well, I have written down
16 a long list of these things at some point, yes. We
17 would want for instance as near to, as close to zero
18 slope as possible, we would want to be assured that
19 there was no drop at the end of the downstream end
20 of the culvert which might impede the estuary migration
21 of fish. We would want to be assured that the depth
22 of water was sufficient to, so that the backs of the fish
23 were under water as they were migrating up. We would
24 want the normal substrate to be preserved if possible
25 through the use of semi-elliptical culverts or something
26 of that sort.

27 We are very much concerned
28 that velocities within the culvert are not--do not
29 constitute a velocity barrier to the upstream migration
30 of whatever fish are moving upstream in this--Most of the

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1 velocity criteria, I should point out, are based, apparen-
2 tly, on the swimming performance of adult fish. We are
3 concerned also that many small streams are utilized to
4 a great extent by juveniles during the course of the
5 summer. This is true of grayling and I think that the
6 criteria for the Mackenzie Highway are excessive. The
7 velocity criteria there in that there is a great potential
8 for the obstruction of the upstream migration of
9 juvenile fish. They are going to, in some instances I
10 think, areas which are formally accessible to the nest
11 feeding areas during the summer will no longer be so as
12 a result of culverting along that highway.

14 Q Mr. Williams, I can
15 appreciate now why Dr. McCart has given you to reason
16 for concern. Do I understand the intention of Arctic
17 Gas or Northern Engineer's recommendation to be that
18 if these criteria cannot be met in a site specific
19 situation, do you go to a different technique?

20 WITNESS WILLIAMS: A Yes.

21 WITNESS HEMSTOCK: A I might
22 point out that my information is that we cross five
23 streams and two of them have fish in, so there are two
24 cases in the whole pipeline where this is a concern.

25 Q We know of its presence
26 in any event?

27 WITNESS MCCART: A That would
28 be of the five ^{between Travaillant Lake or} in that area, two fish and one probable.

29 Q Have you made any recommen-
30 dation with respect to use of dual culverts?

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Minning, Williams
Cross-Exam by Anthony

1
2 A Well, I think that is an
3 engineering decision actually. I don't care whether
4 they are dual or not as long as fish can move upstream
5 through them.

6 Q Mr. Williams?

7 WITNESS WILLIAMS: A Cer-
8 tainly this has been considered in trying to maintain
9 the velocities that Dr. McCart is speaking of. It
10 could be one great large one or several small ones.
11 These have been taken into account and when you put
12 them all together if you have a serious situation an
13 alternative might be more economic.

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Cross-Exam by Anthony

1 Q This is another one of
2 the techniques you can see using to live up to the
3 recommendations of Dr. McCart before you abandon the
4 use of culverts altogether?

5 WITNESS WILLIAMS: Yes, provid-
6 ing the velocities and the other criteria ^{he} ~~that~~ set out
7 can be met.

8 MR. ANTHONY: Mr. Commissioner,
9 I believe Mr. Bayly has a few site specific questions
10 and therefore I propose to leave that issue to him.
11 I merely would like to comment before leaving this issue
12 that we may be interested in pursuing further in Phase
13 3 some of the comments and recommendations that Dr.
14 McCart suggested ^{that} ~~he~~ has made and I would merely ask
15 him if he could perhaps dig through his records and
16 refresh his mind on that point and perhaps we may wish
17 to return to this subject at a later stage.

18 THE COMMISSIONER: All right.

19 MR. ANTHONY: That's all the
20 questions I have.

21 THE COMMISSIONER: Well, we'll
22 adjourn for tea now.

23 (PROCEEDINGS ADJOURNED FOR A FEW MINUTES)

24 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

25 MR. BAYLY: I understand that
26 we'll be sitting for another hour, sir, and what I am
27 going to do is ask Miss Minning her questions first so
28 that I'll only have kept her back for an extra day
29 rather than an extra week. It was at her suggestion,
30 sir.

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Cross-Exam by Bayly

1 CROSS-EXAMINATION BY MR. BAYLY (CONTINUED):

2 Q Miss Minning, if we
3 could follow up the answers that Dr. McCart gave to
4 some of the questions of Mr. Anthony, I understand you
5 were one of the people who visited the Alyeska project
6 with an eye to inspecting some of their gravel mining
7 operations; is that correct? .

8 WITNESS MINNING: That's
9 correct. We didn't spend a lot of time doing that.
10 I / wasn't involved in writing this report. I went at
11 another time, but I had my eye on those same things.

12 Q Yes, and did you, while
13 you were there see any equipment that you could identify
14 as equipment that would be used for pumping out any
15 of the pits?

16 A No, I didn't see anything
17 like that, but I didn't see everything so maybe it
18 exists, I don't know.

19 Q Yes. Now, when you were
20 there, did you have an opportunity to discuss with the
21 Alyeska people, the borrow sites, the mining operations
22 in the active flood plains as opposed to the upland
23 sites?

24 A Not at that time, no.
25 I have on the telephone spoken with people about that.
26 We were passing through when I visited there.

27 Q And did you, from what
28 was said, get any ideas why they were using the flood
29 plain sites as opposed to the upland sites?

30 A Not specifically. I

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1 think that - no, I didn't discuss it in terms of that
2 but I was told that at some time they would choose
3 a site on the flood plain, and be told they were going
4 to an upland site instead and someone else would come
5 along and say, "Why did you ever go into an upland site?
6 It's much worse.

7 So I think that they have
8 trouble, you know, with various bodies of people there.
9 I think it must be very difficult to decide on exactly
10 the best site and follow everyone's recommendations.

11 Q From what you heard from
12 them, that was an agency problem that one agency would
13 say one thing and another would say another. Is that
14 what you understood?

15 A Yes, I think so.

16 Q Did they say what the
17 objections were to the upland site that was used?

18 A I think one of the
19 biggest objections was aesthetics, and I think it has
20 also to do with some of the birds and mammals and this
21 sort of thing.

22 Q So is that the ranking of
23 it. In other words aesthetics?

24 A I don't know the ranking.
25 I think it must be a very complicated thing, with
26 seven or eight agencies contributing.

27 Q Yes, I was thinking of
28 the three criteria that you were suggesting. Does
29 aesthetics seem to be the main reason for avoiding
30 these sites, or did they just speak of the three

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Minning, Williams
CrossExam by Bayly

1 without giving them any kind of emphasis?

2 A There was no emphasis,
3 but I think a flood plain site is, of all the borrow
4 sites, the only one that is ever going to renew itself.
5 In other words, the gravel will eventually come back
6 if the river keeps running, keeps carrying material
7 it will return to its original state. No other borrow
8 site will ever return to its original state.

9 Q Now, when you were dis-
10 cussing the relative merits of mining operations either
11 near water courses or away from them, did Mr. Wooly,
12 I believe it was /^{who went with you} did he indicate whether upland
13 sites were always detrimental to denning animals, or
14 whether they could ever to the advantage of any of the
15 denning animals?

16 A No, he didn't specifically
17 say that. He said that certain sites probably would
18 not affect the mammals if you did borrow part of them.
19 If you take the whole site, yes, it would. This sort
20 of approach.

21 Q All right, well I'll get
22 into that a little more deeply when we get into the
23 Phase 3 portion. But if I can ask you one more question
24 on the upland borrow sites, you indicated that you
25 didn't see any foxes when you were there. Did you when
26 you were inspecting these sites come across any that
27 might have been potential denning sites upon which
28 you found no dens?

29

30

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Bayly

1
2 MR. MARSHALL: I am thinking
3 of Mr. Commissioner, I am thinking of the North Slope,
4 and I understand Miss Minning was there this summer.

5 WITNESS MINNING: I wasn't
6 there all of the time. I think that is probably true,
7 I don't want to say yes or no because I wasn't at all
8 of the sites. I don't really know. He's a very quiet
9 person. He doesn't always tell you everything right on
10 the spot. He is waiting for the report.

11 MR. MARSHALL: As we all are.
12 Mr. Hemstock, do you have any information sir on--
13 -- whether some of the upland borrow sites are potential
14 denning areas as opposed to active denning areas. Or
15 perhaps a better term would be that they would be suit-
16 able for denning but that no evidence for denning has
17 been found on them?

18 WITNESS HEMSTOCK: I would
19 prefer to leave that to, questioning to Mr. Jakinchuk.
20 We have been told--

21 THE COMMISSIONER: He's on the
22 next panel.

23 WITNESS HEMSTOCK: Yes he is.
24 We have been told that potential borrow sites are also
25 potential denning sites. However, there is somewhat
26 of a contradiction here because the den sites which are
27 now occupied are in very limited areas and they also
28 have been occupied for a very long time,
29 so it would appear that the animals aren't, maybe they
30 are not aware about their potential sites, it would seem

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Bayly

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that they are quite restricted.

3

4

MR. BAYLY: They are waiting
for the report too, are they?

5

6

MR. MARSHALL: They are
waiting for a developer to come along.

7

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WITNESS HEMSTOCK: I might
suggest too, of course, that the opening of a pit
certainly provide for additional kind of habitat for
nesting and a possibility of denning but I would think
that that's not an important plus one way or the other.

12

13

Q. But it is something that
we could go into in some more depth with Mr. Jakinchuk?

14

15

A Yes, certainly, He is
qualified to speak on that.

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MR. BAYLY: All right. Now, to follow
up the other matter that Mr. Anthony began and that
is on water supply in various areas. I have chosen
as the site specific area the camp that is located at
Komakuk Beach and the compressor station which is
located nearby, adjacent to the Malcolm River. The
reference on the alignment sheets is to 1C-0200-1003,
and on the route maps to 3A-0211-1002 and Mr. Commissioner,
behind you I have opened the-- I have opened both
of those. One is ^{behind} / you sir on the alignment sheet
and the other is on the table in front of you. And
sir, I see that you have on your table a brown volume
of the responses to the concerns and I realize that it
will involve looking at three things, but under question
52, opposite 52-5, there is another map that has been

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Bayly

1
2 referred to as containing possible water sources. Now,
3 I am referring specifically/^{then}to what is known as Spread
4 C and perhaps both Mr. Williams and Dr. McCart can
5 help in the answering of this question. It appears
6 from that, from a look at both the alignment sheets,
7 the water source map, in the responses and at the map
8 in volume 13, which sets out the facilities, that
9 between the Alaskan border and the Malcolm River there
10 is at present one lake source of water identified and
11 that is slightly to the West of the camp at Komakuk
12 Beach and it is designated as a shallow water lake
13 because it is cross-hatched and then there is a source
14 at the Malcolm River itself which, because it is a river
15 source according to the key, doesn't show whether it is
16 a deep or a shallow source. Now, before asking the
17 question I would like to find out from the panel whether
18 there are other sources that have been identified since
19 these documents were prepared that would provide
20 additional water in this particular spread?

21 WITNESS MCCART: As I pointed
22 out earlier, we have been conducting water availability
23 studies through this area during the course of this
24 summer and yes, we have identified some other potential
25 sources. One of them is on Fish Creek, just above the
26 fan, approximately two miles North of the pipeline
27 crossing / ^{through.} This is one of the potential sources. There
28 is another spring further upstream on Fish Creek also.
29 It is approximately twenty-one kilometres, just above
30 the mouth and maybe eight or ten miles upstream of the

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Bayly

1
2 pipeline crossing. There is of course the, there is
3 the one that is already indicated, the river water
4 source on the Malcolm. We have taken another look at
5 that and have some data for that particular area. There
6 is another one on the Firth River, I think just outside
7 of the area that is cross-hatched north of milepost
8 230. That whole area there is active as far as ground
9 water goes and there in fact several major springs
10 in the area, which are distinct in fact, although they
11 are probably, if we just extend that cross-hatching
12 a little bit further to the west.

13 Q Well if you extend it
14 further to the west.

15 A Oh, sorry. To the east
16 I mean. East.

17 Q East?

18 A East into the fan.

19 Q I was going to say if you
20 went west you would end up in an identified fish
21 over-wintering area. Is that not correct?

22 A Yes. In fact, many of these
23 do have in fact, fish populations in them.

24 Q Yes. Now we have identified
25 additional sources then. What volumes have been
26 identified from the sources and the response as well as
27 the new sources?

28 A Well, the lake at Komakuk
29 Beach; volume that we calculate is 9,409,000 barrels.

30 Q Is that its total volume,

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Bayly

Dr. McCart?

A Yes. That is an estimate
of its total volume.

Q Is it quite a shallow lake?

A It is 2.8 metres, yes.

Q It is the lake then that
we could expect to freeze to the bottom at some point
in the winter.

A No. I think that probably,
probably have several feet of free water because we
would expect approximately six to seven feet and it is
eight to nine feet deep at-- Oh, sorry. Let me go
back again. That is mean depth. I don't know what
the maximum depth is.

Q Yes.

A We presumably have that
information because we did calculate a mean ^{its} but/mean
like
is 2.8 which means that over the average/we would expect
to have possibly two or three feet of water and in the
deeper portions, which we could easily discover, I
am sure we would expect to have more than that.

MR. MARSHALL: That was 2.8
metres I think.

MR. BAYLY: Q Yes. I believe that was the mean
depth so that is close to eight, eight feet and somewhat more.

A Pretty close to nine feet.

MR. BAYLY: Q So,
there would be pockets or little valleys in the bottom
of the lake, or large valleys if you like, that would
have water in them possibly all winter long. But would

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Bayly

1
2 it be fair to say that if we expect an ice cover of
3 six feet, that quite a large volume of the water would
4 be unusable by the end of the winter?

5 A That's right.

6 Q Now what is the quality of
7 that water, because the lake that is identified is quite
8 close to the Beaufort Sea, does it get brackish?

9 A I have some indication here.
10 I am sure. Conductivity is indicated at seventy-eight,
11 which is extraordinarily low for the area. The average
12 in the area, for the most lakes, would be about, oh,
13 one-hundred and fifty to two hundred. So this
14 apparently is not brackish at all. It is unusually low.

15 Q That's an unusual phenomenon
16 is it?

17 A Yes.

18 Q And what would explain that?
19 I understand the relief from the sheet appears to be
20 fairly low although the alignment sheet's window doesn't
21 take us as far as the beach. Is that an area that is
22 protected by bluffs?

23 A I am not certain what the
24 explanation would be. I think we would have to look at
25 this over the course of the year.
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Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 WITNESS WILLIAMS: The strip
2 map does show a stream going in and a stream going
3 out, Mr. Bayly.

4 Q Yes, I realize that, Mr.
5 Williams. My concern is that unless there are bluffs
6 it's possible that a severe storm in the Beaufort Sea
7 might well cause a fall salination of potential
8 water supply that Arctic Gas might be depending upon.
9 That is a possibility unless there are bluffs, I take
10 it. Would that be correct?

11 WITNESS McCART: Apparently
12 there has been something that has prevented that in
13 the recent past at least, but certainly the conductivity
14 is very low, much lower incidentally than you find in
15 the springs in the area.

16 Q Yes, and is that a lake
17 that has been assessed as a habitat for fish or any
18 other aquatic life?

19 A I don't have those data.
20 We did not fish ^{it} on this last trip and I don't know
21 what in fact lives in the lake.

22 Q It is possible then
23 that it might be a fish lake and possibly also an
24 over-wintering spot if there was a creek leading from
25 it to the Beaufort Sea?

26 A Yes. I think that
27 information should be readily available.

28 Q Yes.

29 A From personnel on the
30 site; if I cannot locate that information in other

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 sources of information.

2 Q Now, that's one source.

3 The next source close to that camp is approximately
4 ten miles away, whether you go up -- sorry, there's
5 one up the top of the delta fan, that is at the south
6 end of the delta fan, Fish Creek. What sort of
7 volumes can we expect would be found there?

8 A Our calculation gives it
9 163.7 barrels per minute, which averages out to about
10 235,000 per day.

11 Q And at what season was
12 that measurement taken?

13 A That was taken in October,
14 I think, of this year.

15 Q So that's at low water
16 time,

17 A Relatively, yes. Well,
18 there's not much surface drainage so this is essentially
19 groundwater flow we're talking about.

20 Q And was the flow in and
21 out of that lake that you identified by the beach, by
22 Komakuk Beach, one that flowed in the fall as well?

23 A I don't know for a fact
24 that it does, no, but I would suspect not.

25 Q And when were the
26 measurements taken on the volume of that lake, what
27 season?

28 A October.

29 Q Again we're looking at
30 the lowest season of the year, is that correct?

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 A As far as surface
2 runoff and reach are, yes, we're into that period
3 of the year.

4 Q When you do measure
5 these lakes, Dr. McCart, do you check the weather
6 in the month say before you go in to see whether
7 there has been a major storm event that may make your
8 calculations other than average, at least for the year?

9 A No, but I think that
10 normally the level of the lake is approximately the
11 level of the outlet, and it isn't going to vary appre-
12 ciably in these lakes at least. You don't have many
13 instances of lakes in this area dropping dramatically
14 during the course of the summer, or rising as a result
15 of a short-term storm event because this is, I should
16 point out, a very limited drainage basin obviously.
17 It would have to be a very heavy and localized storm to
18 cause any radical change in the volume of this
19 particular lake, a lake of this kind.

20 Q Where does the Dew Line
21 site at Komakuk Beach get its water supply?

22 A Well, that's something
23 we're not quite sure of, I think.

24 Q Is that classified infor-
25 mation?

26 WITNESS WILLIAMS: I've been
27 there several times and I have landed on that lake
28 with a float plane and it seems to me I did see them
29 hauling water from there, but that's not reliable
30 information. That's just a recollection I have. But

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 we can sure find out, and will.

2 Q All right, because their
3 needs, I assume, would have to exist with yours,
4 provided the site wasn't abandoned before you got
5 to it.

6 A Right.

7 Q And we've now identified
8 two sources. If we move to the east there is a source
9 that's been identified at the map opposite 52-5 of
10 the responses as being to the east side of the top
11 of the delta fan of the Malcolm River. Is that
12 correct?

13 WITNESS McCART: Yes.

14 Q Actually, it's not right at the top,
15 it's part-way down; and what sort of volumes do you
16 expect are available there?

17 A In October this year
18 there were approximately 340,000 barrels per day.

19 Q And that particular
20 source is very close to the proposed compressor station?

21 A Yes.

22 Q Which is No. CA-05,
23 according to your numbering scheme; and I assume that
24 although it isn't marked in the same tables, as camp
25 needs, that the compressor station will have needs for
26 water as well. Mr. Williams perhaps can answer that.

27 WITNESS WILLIAMS: Certainly.

28 Q And the camp at spread
29 "C" is a large camp, is projected as a large camp,
30 is that correct, Mr. Williams?

Harlan, Homstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 A At CA-05?

2 Q Yes. Well, there are two
3 camps, I'm assuming. One to build the compressor
4 station, and one to build the pipeline along spread
5 "C". Would I be correct in stating that? We've heard
6 in earlier evidence that you would have separate
7 construction crews building the two kinds of facilities.

8 A Right, and in general
9 terms the pipeline construction camp is about 800
10 people, and the compressor station construction crew
11 about 200 people.

12 Q Now then, we're looking
13 at 1,000 people. Right?

14 A I haven't looked lately,
15 do those two operations go on simultaneously?

16 Q Mr. Carter and I looked
17 at his before coffee and we agreed they did; but that
18 doesn't mean that we necessarily interpreted it
19 correctly. Mr. Williams, if I can refer you to
20 drawing 4-0215-1008-B, have you got that, sir?

21 A 4-0215-1008-B?

22 Q Yes sir, and the way
23 I read the legend and interpret the various dashed and
24 solid lines, it appears that during the same season
25 CA-05 is under construction while the leg -- while one
26 of the legs to Prudhoe Bay is being worked upon.

27 A Yes sir, that's right.

28 Q And so my figures of
29 1,000 men in a particular season would not be inaccurate.

30 A Right.

Harlan, Hemstock, McCart
Minning, Williams
CrossExam by Bayly

1 Q Now,, I am assuming that
2 you have done projections as to how much water just
3 for living, to begin with, will be used per man per
4 day.

5 A Yes sir.

6 Q And what is that in either
7 gallons or barrels?

8 A 80gallons per capita per
9 day.

10 Q Too bad it isn't 100, it
11 would be easier to multiply.

12 A Well, the number, we've
13 been using 80 in the large camps, 100 in the smaller
14 camps, but go ahead and use 100 if it's easier for you.

15 Q Well, let's say 80,000
16 gallons per day for the domestic use of the camps, is
17 that correct? 1,000 men for two camps, times 80, is
18 80,000 per day.

19 A Right.

20 Q Now in addition to that
21 we have to look at 52-1 of the responses to see what
22 the other requirements are for spread "C".

23 A Yes sir.

24 Q Now, I see that we have
25 as a camp requirement volumes that vary between 10 and
26 55,000 -- what are those things, barrels or gallons?
27 In barrels.

28 A Barrels per month.

29 Q Barrels per month.

30 Unfortunately, I'm not quick enough to be able to work

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 that out in gallons per day.

2 WITNESS McCART: It's already
3 there in the second-last line, I think,
4 "Daily requirements."

5 Oh, you wanted it in gallons, sorry.

6 MR. MARSHALL: It might help
7 you, Mr. Bayly, if I were to tell you that Dr. McCart
8 has, I think, put together what the spreads water
9 requirements are.

10 MR. BAYLY: All right.

11 MR. MARSHALL: For spread "C".
12 I don't think he's got the compressor station construc-
13 tion camp, I think he's done it for the spread camp.

14 MR. BAYLY: All right, then.

15 Q Would it be fair, Dr.
16 McCart, to add 25% to the daily requirements for the
17 camps so that you could accommodate the needs of the
18 construction of the compressor station?

19 A I think that probably
20 Les Williams is better able to answer.

21 Q All right. It's just
22 that your counsel directed me to you. Mr. Williams,
23 would it be fair to add 25% then to the daily camp
24 requirement?

25 WITNESS WILLIAMS: Well, I
26 haven't gone through the calculation, Mr. Bayly, but
27 if you say that you've gone through the calculation
28 and this just accounts for an 800-man camp rather
29 than 1,000--

30 Q Well, actually that's the

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 question I'm asking you, whether spread "C" includes
2 that compressor station camp. It doesn't say whether
3 it does or doesn't.

4 A I'm not sure, but go
5 ahead and add the 20%. I don't think it's significant.

6 Q All right, so we're
7 looking at as much as, in January and February, the
8 two cold months, a need to withdraw 55,000 plus 20%,
9 which would be another 10,000 barrels per day,
10 approximately.

11 A Fine.
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Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

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Q 65,000 barrels per day

during those months. Now --

A Barrels per month.

Q Sorry, barrels per month.

A Right.

Q We are getting -- I am
getting confused between gallons per day and barrels
per month. All right. Now, I gather you are not
concerned and maybe Dr. McCart can answer this one
with -- I have had the advantage of someone with
a mathematical brain who told me that 80,000 gallons
per day we can say is approximately 4,000 barrels per
day and if that is --

WITNESS HEMSTOCK: A It is
approximately 2,000 barrels a day.

Q Approximately 2,000 barrels
per day? So that gives us 60,000 barrels per month.

WITNESS WILLIAMS: A Dr.
Harlan has just worked it out to 68,000.

Q All right. Now, your
concern, I gather, is not that the water won't be
there? I gather you are projecting that there will
be enough water for those two camps?

WITNESS McCART: A Are we
concerned that there will be enough water?

Q That is correct.

A I don't think so. I
think if you take the table, I did some rapid calcu-
lations a couple of days ago -- a table of water

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1
2 requirements and the responses here, you will find
3 that the total is approximately 1.2 million barrels
4 for the year and that is equivalent to something like
5 1.4 days flow from one of the larger springs that we
6 have identified there.

7 A Yes.

8 Q So that we are not talking
9 about a volume requirement which is large in relation-
10 ship to the volume of water available.

11 Well, now that is the
12 volume of water available during some times of the
13 year because I gather that there, for example, the
14 there is the possibility that your river source won't
15 be available in the cold months when you have given
16 evidence that these rivers generally freeze to the
17 bottom except in the aquifers.

18 A No, in fact, we are talking
19 about, when we are talking about springs, we are
20 basically talking about perennial springs continuing
21 to flow year around and many of these. In fact, the
22 volume doesn't change appreciably throughout the year.
23 Now, we are going to go back in late winter and look
24 at these specific ones again. Some we know are
25 perennial. We know they continue to flow at a high
26 volume at a very stable rate throughout the year. We
27 already know that for the Firth spring too as we call
28 it but we are going to check out the other ones and
29 find out whether this in fact true in the other cases
30 too.

Harlan, Hemstock, McCart
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Cross-Exam by Bayly

Remember, however, that the largest water requirement is early in the year when snow road construction is under way early in the winter and this is, even if some of these springs do tend to -- if the discharge tends to fall later in the winter that the largest water requirement will be early.

Q All right. Now, Mr. Williams, that brings me to --

MR. MARSHALL: Mention was made of a spring and I was just wondering if we could have it identified by location.

MR. BAYLY: The spring is on the Malcolm River. I identify it as the one on the map opposite 52-5 which would be on the east side of the Malcolm River alluvial fan somewhat down from the beginning of that fan to the north.

WITNESS MCCART: A I might point out when I talked about the 1.4 days flow, I was talking about the Firth River spring which is located two miles north of Milepost 233. I used this as an example.

MR. BAYLY: Q When you get to Firth River spring, I take it, Dr. McCart, you have got a long way in terms of water hauling from both the Komakuk Beach camp and the Malcolm River compressor station site. Perhaps 15 or 20 miles.

A The Malcolm River spring -- it would be approximately 6 or 7 days flow

Harlan, Hemstock, McCart,
Minning, Williams
Cross-Exam by Bayly

1
2 would supply the total water requirement indicated for
3 spread C on the table here.

4 Q Yes, but you are not
5 taking it that way. I take it. You are not going to
6 put up storage tanks. You are going to take it as
7 you need it.

8 A Yes.

9 Q And, before I lose track
10 of snow roads, Mr. Williams, I take it that the estimates
11 on this table at 52-1 are snow roads if they have
12 to be build entirely with manufactured snow. Is that
13 correct?

14 WITNESS WILLIAMS: That
15 is correct, but that number is not based on the full
16 spread length. It is based on a situation in the
17 early part of the year where there may be a shortage
18 of snow that you would manufacture snow. But it is
19 not for the full 65 miles of right-of-way. That million
20 barrels would build -- the snow roads per se run at
21 about 21,000 barrels per mile, the additional snow
22 required for the working surface could run as high
23 as 32,000 barrels a mile so we are talking about a
24 potential of 50,000 barrels per mile of prepared right-
25 of-way.

26 Q Is that 20 miles per
27 million barrels?

28 A About 20 miles of fully-
29 prepared right-of-way.

30 Q So, you are counting on

Harlan, Hemstock, McCart,
Minning, Williams
Cross-Exam by Bayly

1
2 more than almost two-thirds or perhaps even slightly
3 more than two-thirds of your snow road requirement
4 coming from snow rather than water.

5 A Yes.

6 Q And is that based on an
7 average season projection or worst case projection?

8 A I would put it towards the
9 worst case and Mr. Bayly, with the use of snow fencing
10 I would anticipate cutting that number -- that million
11 barrels down significantly.

12 Q Yes. Now, the projections
13 that you have used on the gallons per man per day --
14 Have you checked with Alyeska to see whether, in fact,
15 the requirement isn't more like 150 to 250 gallons
16 per man per day in the camps?

17 A No, I haven't checked the
18 figure. These figures did come from people like
19 Atco that build camps and this was the number they
20 suggested.

21 Q Yes, and I take it, it
22 would be possible in your time to time checking up
23 with other projects to find out whether these figures
24 do hold up for the kind of construction that you are
25 going to be doing?

26 A Yes, and but again, there
27 are measures that can be put in like a form of rationing
28 if it becomes necessary.

29 Q Now, when you say, like
30 a form of rationing, do you mean a form of rationing?

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Minning, Williams
Cross-Exam by Bayly

A It is pretty well
standard in the Atco units are water savers
in the shower for instance. At Sans Sault, the first
thing I did was take them out but --

Q Does that mean that it
comes back and you use again or how do they save water?

A No, it is an orifice in
the shower head that cuts down the volume of water
coming to the shower.

Q So, you can only turn it
on half what would normally be full volume?

A Yes.

Q I think we had showers
like that at school.

One of the concerns that
I have, Dr. McCart, is that water which may be extracted
from lakes that have fish in them and I gather there
are several deep lakes and the one that we used in
the example is one that may have fish in them may
lower the amount of dissolved oxygen available to
fish. Now, is that fair to say?

WITNESS MCCART: A Now, it
seems to me I was asked this question in Washington.
I have difficulty seeing the relationship there. I think
it very much depends on the shape of the lake basin. I
think that most of the uptake of oxygen in lakes
occurs at the bottom --the mud-water interface, I think,
limnologists call it and that in fact if you reduce
the volume of the lake so that the surface to volume

Harlan, Hemstock, McCart,
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ratio is lower you can concieve of a lake which had a very wide expanse of shallow water, in other words, a very large surface, bottom surface to volume ratio and the oxygen uptake from the water would be very considerable if you reduced the volume of the lakes so that it was concentrated in a rather deep hole, the surface to volume ratio would be reduced and for this reason it is quite likely that in fact oxygen reduction might take place at a slower rate. I think it is a very complicated and complex problem and I don't think that you can generalize about it.

Q All right. Well, that means you have to particularize and have you done the studies that have convinced you that this in fact is not going to be a problem.

A I think that we would certainly recommend that the volume of water withdrawn would be small in relationship to the total volume of the lake so that this kind of consideration is probably not going to be important.

Q All right. And how do you fix a figure for that?

A Well, I think we have to find out whether there are, in fact, fish in the lake. We have to know something possibly about its utilization by birds -- what kind of birds --things of this sort. I think that if you look at the lakes that we are considering in relationship to water utilization, some of them have upwards of a billion

Harlan, Hemstock, McCart,
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Cross-Exam by Bayly

1
2 barrels of -- maybe I had better take that back -- I
3 am not sure whether it is gallons or barrels but
4 very, very large volumes in relationship to, you know,
5 the potential need.

6 Q Yes.

7 THE COMMISSIONER: Dr. McCart,
8 excuse me, Mr. Bayly, the theme of many of your
9 responses so far has been that there will be more than
10 adequate supply of water at those camps along the North
11 Slope to supply the requirements of Arctic Gas.

12 A There are very large
13 quantities of water available, yes.

14 THE COMMISSIONER: Well, you
15 do not regard the water supply as a problem?
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Harlan, Hemstock, McCart
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Cross-Exam by Bayly

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WITNESS McCART: Well, I

regard it as a problem in this way. You simply can't run in there and take as much as you want in any way that you feel like taking it. From a fisheries point of view we would want to be assured that appropriate measures were taken to ensure that fish populations were not affected detrimentally by water withdrawal. That's our major concern. But I think that yes, there's a great deal of water available, some of it in areas which have only marginal utilization by fish; some of it, for instance, in lakes which we haven't been able to find fish at all.

Now by preference obviously we would prefer that the water be withdrawn from locations where there is no fish populations, from lakes which freeze solid to the bottom in winter, for instance. Now the point has to be made that lakes don't freeze instantly, that by -- our figures indicate that by December 15th we would expect only approximately two feet of ice, at least that has been the situation in the years in which we have been on the scene. Now that is a period during which large volumes of water are -- will be required if it's a low snowfall year and if, you know, there is a considerable requirement for snow road construction. But up to that point and even beyond, there are still large volumes of free water remaining under the ice.

Q One of the problems may be if the fish aren't particularly clever at finding the deepest spots, they may have decided to over-winter

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 in a spot that becomes frozen to the bottom. I gather
2 that's one of the fisheries' concerns.

3 A Yes, but the fish that
4 aren't particularly clever in finding the deepest
5 spots don't survive, so they don't produce offspring
6 who are equally stupid, you see. There's a natural
7 selection for fish that can find the deepest spots.

8 Q Well, Dr. McCart, the fish
9 haven't read the application yet, so they probably
10 don't know that you intend to take water.

11 A O.K., we would take
12 (a) from water, if we're talking about lakes,/lakes which have
13 no fish population or (b) from lakes which are so deep
14 and have such a large volume that the water withdrawal
15 will only be a small proportion of the total volume.
16 Obviously the lakes you want to avoid are the ones that
17 are marginal in depth where you may have fish which
18 are confined to a very small area in the lake. We
19 know some of these lakes, you see. I'm amazed
20 that they can survive at all simply because the natural
21 volume of water is very small and the natural oxygen
22 levels are also very low. In those lakes we find
23 typically sticklebacks.

24 Q And those may be lakes
25 where the change in the amount of oxygen is more
26 critical than in lakes with larger --

27 A Right, yes.

28 Q And the other problem
29 you may have is policing people like Mr. Williams
30 with pipe wrenches, if you do want to put restrictions

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 on water used to make sure that they don't over-use,
2 is that correct?

3 A I think it's part of the
4 -- at this point, incidentally, we are just looking
5 for potential water sources. If and when some decision
6 is made, we will have to go in and do more detailed
7 work and we will have to define volumes and look at
8 bottom contours in much more detail and things like
9 this.

10 Q If one of the conditions
11 of the granting of the right-of-way were to err on
12 the safe side and not take water out of either rivers
13 on the North Slope or lakes that you were able to
14 identify as having fish in them, would there still be
15 enough water for the requirements that you have on the
16 North Slope?

17 WITNESS WILLIAMS: I would
18 think yes, but it would be a long haul in some cases.

19 Q Yes.

20 WITNESS McCART: That would
21 be my thought too. You might use up the water in
22 building snow roads to your remote locations, you
23 know, this would be a factor you'd have to balance out.

24 Q So although there are
25 vast quantities of water, there are these problems
26 that probably in some areas where there is a good
27 supply of water there may also be a supply of fish.

28 A Right. But I think that
29 we can define methods of taking water even from these
30 areas, or some of these areas without damaging fish

Harlan, Hemstock, McCart
Minning, Williams
CrossExam by Bayly

1 populations.

2 THE COMMISSIONER: You might
3 tell me when you reach a natural break and we will
4 adjourn.

5 MR. BAYLY: Actually this
6 is a natural one, sir, although I may have reached
7 others.

8 THE COMMISSIONER: Well,
9 before we adjourn, I think we'll adjourn a few minutes
10 early because the Inquiry staff and the court reporters
11 have to get all this equipment down and stashed
12 away and then run for the plane.

13 But there's about three
14 matters I'd like to discuss with counsel before we
15 adjourn. The first is that next week, as I said
16 yesterday, we'll begin Wednesday at 1 P.M. and we'll
17 sit Wednesday afternoon and Wednesday evening. We'll
18 sit Thursday morning, afternoon and evening, and then
19 Friday morning and Friday afternoon adjourning in
20 time to get the plane to Fort Smith.

21 Now it is possible but not
22 likely that the Fort Smith community hearing may not
23 proceed. We won't know for certain until Monday. It
24 looks as if it will proceed, but if it doesn't, I
25 think that we should carry on Friday next week in the
26 morning and the afternoon, and then hold our Saturday
27 morning hearing again, just to make sure that we get
28 on as far as we can.

29 I just ask you to bear that
30 in mind because it may alter our plans if the Fort

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 Smith hearing is for any reason cancelled; but as far
2 as I know the Fort Smith hearing is going ahead. I'm
3 just warning counsel about it and I'd appreciate it
4 if the people from the C.B.C. would not suggest that
5 if there is any possibility of it being cancelled,
6 because if it said over the air that I suggested it
7 might be cancelled that soon gets around as a statement
8 on my part that I have ordered it cancelled. I want it
9 to go ahead.

10 The second thing is this, and
11 I just want to be sure where we're at, Mr. Ryder. When
12 we have finished with this panel, which I hope we can
13 do early next week, that is by Wednesday evening or
14 Thursday morning, we will hear the Foothills panel on
15 water, terrain and air. Now, given what I take is the
16 likelihood that the Foothills panel will be covering
17 a great deal of the same ground, not to mention the
18 same water and the same air, we should get through the
19 Foothills panel in a much shorter time than we got
20 through the Arctic Gas panel. That's been the pattern
21 and I would expect it to repeat itself.

22 Then I take it we have the
23 Arctic Gas panel on mammals, birds and fish, and then
24 the Foothills panel on mammals, birds and fish. Is
25 that the schedule, Mr. Ryder?

26 MR. RYDER: That's as I under-
27 stand it, Mr. Commissioner. And following that the
28 evidence of the interveners.

29 THE COMMISSIONER: Well then
30 we would have the evidence of CARC on mammals, birds

Harlan, Hemstock, McCart

Minning, Williams
Cross-Exam by Bayly

1 and fish, and then the evidence of any of the other
2 interveners, and then the evidence of Commission
3 counsel on mammals, birds and fish. All right now,
4 --
5

6 MR. RYDER: There may be some
7 questions, sir, about the physical environment.
8

9 THE COMMISSIONER: Yes.

10 MR. RYDER: The living
11 physical environment.

12 THE COMMISSIONER: Yes. Now
13 that gives us five weeks until Christmas to complete
14 Phases 2 and 3. So I hope that you all will bear
15 with me if we try to work very hard next week in the
16 time available to us, and I hope the court reporters
17 will bear with us because it is more difficult for
18 them than for any of us.

19 Now , there is one other
20 matter that I would like to raise with counsel, and that
21 is a matter that Dr. Banfield brought up in Whitehorse.
22 Dr. Banfield was a witness for Arctic Gas. He is an
23 environmental consultant to Arctic Gas, and we all, I
24 think, would acknowledge that he is a distinguished
25 man in his field and he urged me at Whitehorse to
26 consider altering the way in which we hear evidence.
27 He thought the lawyers played too prominent a part in
28 the presentation of evidence, that their cross-examination
29 often tended to inhibit full and free discussion. Now
30 he may be right about that, he may be wrong; but I was
grateful to him for bringing the matter up.

Harlan, Hemstock, McCart
Minning, Williams
Cross-Exam by Bayly

1 He urged that we should have
2 the environmentalists sitting together, that is the
3 environmentalists on both sides of the given issue,
4 sitting together on the panel and debating the thing
5 among themselves with the role of the lawyers restricted
6 and the environmentalists simply given an
7 opportunity to hack away at each other to the edifica-
8 tion of all of us.

9
10 Now I think that counsel should
11 give very serious consideration to that. I've already
12 told Mr. Scott and Mr. Goudge that I want them to con-
13 sider this, and I mention it to the rest of you so
14 you can think about it between now and next week.

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Bayly

1
2 I think that
3 if counsel can work it out in a way that is fair to
4 everybody that we should have a Banfield type panel and
5 you may want to consider that when we reach Dr.
6 Banfield's specialty so that he can sit on that panel
7 and those who opposed Dr. Banfield's ^{point of} view, the witnesses
8 on behalf of Canadian Arctic Resources Committee, for
9 instance, can sit on the panel with him and you can come
10 up with a proposal regarding the way in which the
11 questioning should proceed; whether it should only
12 occur after the environmentalists have been bashing
13 away at each other for a day or two or whether it
14 should come earlier than that. In this inquiry, we
15 are conducting really for the first time in Canada an
16 examination of the impact of large scale frontier
17 development. It has never been done before in this
18 country and I am willing to consider innovations that
19 are suggested and Dr. Banfield suggested one and I must
20 say I thought it was a good idea and I thought we
21 should try it and I am now asking all of you, the
22 lawyers for the pipeline companies, the native or-
23 ganizations, for the Canadian Arctic Resources Committee
24 and Commission counsel to consider it and come up with
25 some kind of workable way of doing it. Let me give
26 you an example of what I mean. We have heard from a
27 number of witnesses on a number of occasions about the
28 impact that the Arctic Gas pipeline ^{would be} along the North
29 coast of the Yukon, the impact that it would have on the
30 Porcupine caribou herd, the herds calving grounds are

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Cross-Exam by Bayly

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2 there on the coast, and the impact it would have on
3 the species and variety of birds that have their
4 nesting grounds and staging grounds on the Arctic
5 coast. That is the impact of the pipeline and the
6 development that might occur in its wake. Now, we heard
7 from Dr. Livingston, in the overview, about the bird,
8 the impact on birds. We heard from, I think Dr.
9 Jakinchuk, in the overview, about the impact on cariboo
10 at Whitehorse. We heard from Dr. Geist and Dr.
11 Banfield and Dr. Weedon about the impact on cariboo and
12 I take it that we will hear from the Arctic Gas people
13 and the Foot Hills people and the CARC people about
14 the impact on cariboo and birds along that coastal
15 strip between now and Christmas. So, it may be that
16 you can usefully arrange for these people who have
17 these different points of view, I don't say necessarily
18 opposing, but differing at least, to get together on a
19 panel and let them talk it out. If it turns out to be
20 a good idea we can all give Dr. Banfield the credit.
21 If it turns out to be a not very good idea then you can
22 all blame me. The important thing though is, it
23 seems to me that we should be willing and you people
24 as lawyers, should be willing to consider other ways of
25 examining this evidence, new ways of examining this
26 evidence, ways that may throw greater light on these
27 problems. I am only taking this problem of the impact
28 on cariboo and birds on that coastal strip because that
29 has arisen again and again and we are reaching the point
30 where we'll have to examine this very closely.

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Bayly

1
2 Now, I am just asking you gentlemen to think about
3 this over the weekend and come up with a proposal and
4 consultation with Mr. Scott that would enable us to
5 have a Banfield type panel. I sympathize with Dr.
6 Banfield because you remember that he was sitting at
7 the end of a table of witnesses, they were all I think
8 engineers except for Dr. Hemstock and Dr. Banfield, and,
9 when in doubt why not say doctor/, then you don't insult anybody, and you will recollect
10 that he said that he felt like a zombie sitting there
11 on the end of the panel. Nobody ever asked him any
12 questions and when they did they were legal type
13 questions and he never had a chance to say what was on
14 his mind and I would like to hear what was on his mind
15 and I would like to hear what is on the minds of the
16 other people, the experts who spent their lives studying
17 cariboo, birds and have views, decided views on the
18 impact that pipeline development and related development
19 would have on the North coast. Now, if you can build
20 a Banfield type panel around another kind of situation,
21 go ahead and do it. I enjoy listening to the evidence
22 and the way the lawyers have brought it out and I think
23 you have all done a first class job. I think though,
24 that we should consider doing it in a different way and
25 see how it works out, especially since the suggestion
26 came from Dr. Banfield, a distinguished environmentalist,
27 a consultant to Arctic Gas, who holds definite views about
28 the impact that a pipeline would have and who is
29 certainly not a hired gun for Arctic Gas. He blasts
30 away indiscriminately against everybody, that is an over-

Harlan, Hemstock, McCart,
Minning, Williams.
Cross-Exam by Bayly

1
2 statement, but he certainly wasn't afraid to take
3 anybody on, including Arctic Gas, the people that were
4 paying him. So, he is the kind of witness you like to
5 see around here and I don't mean ^{that} his willingness to
6 blast away at Arctic Gas makes him a useful witness but
7 his independence. He doesn't care who is paying him
8 and I would like to hear more from him and to hear
9 the evidence given in the way that he suggested. Well,
10 sorry to go on about that, but I think it is important
11 that in this inquiry we try to do things in a new way.
12 We have done that at the community hearings, listened
13 to what ordinary people have to say. We have been to
14 twenty communities, twenty towns and villages and
15 settlements in the Yukon and the Northwest Territories
16 and we have listened to those people. We have listened
17 to five-hundred witnesses and if you count everytime
18 Mr. Williams turns up here as a witness, maybe it is
19 about five-hundred and fifteen but we, we have been
20 willing to try new ways of making sure we get to the
21 bottom of this and I would like to try it in the way
22 that Dr. Banfield suggested. So, then we will adjourn
23 until 1:00 on Wednesday, November 12, 1975.

24 (PROCEEDINGS ADJOURNED TO NOVEMBER 12, 1975)
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G.F. CREBER

MACKENZIE VALLEY PIPELINE INQUIRY

Government
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS
CROWN LANDS WITHIN THE YUKON TERRITORY AND
THE NORTHWEST TERRITORIES, and
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY
THAT MIGHT BE GRANTED ACROSS CROWN LANDS
WITHIN THE NORTHWEST TERRITORIES,
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE
and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

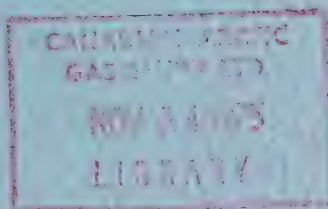
(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

November 12, 1975.

PROCEEDINGS AT INQUIRY

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APPEARANCES:

Mr. Ian G. Scott, Q.C.,
Mr. Stephen T. Goudge,
Mr. Alick Ryder and
Mr. Ian Roland for Mackenzie Valley Pipeline Inquiry;

Mr. Pierre Genest, Q.C.,
Mr. Jack Marshall, and
Mr. Darryl Carter for Canadian Arctic Gas Pipeline Limited;

Mr. Reginald Gibbs, Q.C. &
Mr. Alan Hollingworth for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &
Prof. Alastair Lucas for Canadian Arctic Resources Committee;

Mr. Glen W. Bell and
Mr. Gerry Sutton for Northwest Territories Indian Brotherhood, and Metis Association of the Northwest Territories;

Mr. John Bayly or
Miss Leslie Lane for Inuit Tapirisat of Canada, and The Committee for Original Peoples Entitlement;

Mr. Ron Veale and
Mr. Allen Lueck for The Council for the Yukon Indians;

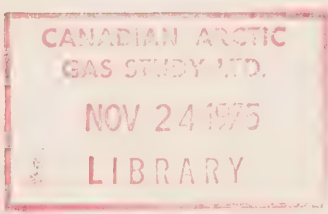
Mr. Carson H. Templeton, for Environment Protection Board;

Mr. David Reesor for Northwest Territories Association of Municipalities;

Mr. Murray Sigler for Northwest Territories Chamber of Commerce.

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Harlan, Hemstock, McCart, Williams
Cross-Exam by Bayly

Yellowknife, N.W.T.

November 12, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. MARSHALL: Mr. Commissioner,
there had been a request for Arctic Gas to produce two
documents. One was Mr. Hemstock's paper,

"Strength of Ice Covers,"

taken from I.P.R.T.-1-ME-67,

"Ice engineering pertinent to the oil industry."

The second was a report of the
proceedings of the International Conference on Land
for Waste Management held in Ottawa, October of 1973.

I have those two documents now, sir, and we'll keep them
here in the office and any of the counsel who would like
to examine them can do so.

R.L. HARLAN,
R.A. HEMSTOCK,
PETER J. McCART,
GUY LESLIE WILLIAMS, RESUMED:

CROSS-EXAMINATION BY MR. BAYLY (CONTINUED):

Q Gentlemen, when we left
off last week it was in the discussion of the facilities
for what is known as spread "C" and compressor station
CA-05, and we had discussed water requirements and
water availability and I'd like to have you turn your
attention now to the plans that you would have for the
disposal of sewage at this particular location, and
would you tell me first if I'm correct that your
general preference in a camp of this size would be
to discharge your sewage into swampland?

Harlan, Hemstock, McCart,
Williams.

Cross-Exam by Bayly

1 WITNESS WILLIAMS: Well, I
2 think we've mentioned a couple of times, Mr. Bayly, that
3 the water supply and sewage disposal for each camp is
4 a site specific study that hasn't been done. We have,
5 in the application and in the filed testimony suggested
6 some alternatives that are available, and certainly the
7 testimony suggests that the most desirable way of
8 disposing of treated sewage effluent is to discharge
9 it into swampland, yes.

10 Q Now, looking at the site
11 of the Komakuk Beach camp facility, it appears that
12 there is one lake from which you would withdraw a sig-
13 nificant amount of water, and apart from that the only
14 swampland^{appears} to be in the vicinity of that lake itself.
15 Have you examined this with the idea of whether it would
16 be possible to use this swampland in order to discharge
17 treated effluent, or whether in fact you would have to
18 discharge it either into that lake or -- which I gather
19 would not be preferable because you want to take your
20 water supply from it -- or into the Beaufort Sea?

21 A No, we haven't looked at
22 it in detail, Mr. Bayly. We certainly wouldn't plan
23 on discharging it in the vicinity of the lake, in the
24 swampland around the lake. No, that wouldn't be
25 desirable. Not only would we be taking, probably port-
26 able water from that lake, but I understand that the
27 Dew Line site also uses that as a water supply.

28 Q Have you examined what
29 they do with their sewage effluent at that Dew Line
30 site?

Harlan, Hemstock, McCart,
Williams

Cross-Exam by Bayly

1
2 A Well, I tried to look into
3 it on the weekend, Mr. Bayly, and my best source of
4 information was Mr. Glasrud who you probably know
5 is with Northern Engineering and he has been there
6 several times and his recollection is that it is dis-
7 charge -- the sewage is discharged into a small creek
8 that flows into the Beaufort Sea. That's just his
9 recollection.

10 Q Yes. Is that the same creek
11 which flows out of the lake from which you would anti-
12 cipate taking water?

13 A He wasn't sure. I would
14 suspect not. I think the creek that they discharge in
15 is a little closer to the camp than that lake is. I
16 think that lake is a couple of miles at least from the
17 Dew Line site.

18 Q All right. Now, in order
19 to assess the water supply on the North Slope, it's
20 my understanding from both the response to the Pipeline
21 Assessment Group and from a look at the application
22 Section 14-DM-1.3.7 and figure 3.7-3 that -- and you may
23 want to look at those references -- that a number of the
24 lakes from which you would anticipate, at least in your
25 response, taking water are ones which had not been studied
26 by Dr. McCart. Perhaps Dr. McCart would care to respond
27 to that.

28 WITNESS MCCART: Well, in fact I
29 think the opposite is true. If you look at 3-A-0217-1002
30 the lakes that are included there are lakes that for which

Harlan, Hemstock, McCart,
Williams

Cross-Exam by Bayly

1
2 depth data was available simply because we had in
3 fact been studying fish in those lakes.

4 Q All right, but Dr. McCart,
5 if we do go to the response and now getting away from
6 the site specific in the Komakuk Beach area, the map
7 at 52 -- opposite 52-5, shows quite a large number of
8 lakes, most of them shallow, from which it is anticipated
9 that water will be taken between the Demarcation Point
10 and Mile 260.
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Harlan, Hemstock, McCart,
Williams,
Cross-Exam by Bayly

Is that correct?

A Yes.

Q And, at that time, or at the time of the application, if we refer to 14DN 1.3.7.3 page 16, it appears that at the time of the writing of the application only five lakes had been studied by you in this particular stretch. Would that be fair to say? Now, that may have changed in the interim because the application is now a couple of years old.

A No, that would not be true. In fact, we had looked at a considerably -- Within that cross-hatched area only?

Q I am thinking -- In this map there are several cross-hatched areas.

A I can't remember how many lakes we had looked at at the time the application was made. However, we were concerned in looking at water availability at lakes that were within let's say three or four miles on either side of the pipeline and we may have looked at eight or nine of them in that area.

Q Yes. Had you looked at -- ?

A Since then we have looked at a considerably larger number.

Q Have you looked at all the lakes that are cross-hatched or marked in this?

A No.

Q Would it be fair to say then that it's still a matter of needed research to find out whether some of these lakes do have populations of fish, for example?

Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1
2 A We're in the process of
3 doing that?

4 Q Right. And you would
5 anticipate that before making your decision of whether
6 to take water from these lakes that you would have an
7 assessment of each and everyone of the ones that were
8 intended?

9 A Oh yes. Yes.

10 Q Now, fish aren't the only
11 things that use these lakes as I understand it and we
12 may be getting out of your depth and into something that
13 we can go into more deeply in the Phase 3 portion but
14 there are other aquatic species and other users of
15 water and say the margins of lakes that must be con-
16 sidered and for example, you may find that certain
17 shallow lakes are ones that are important for duck
18 nesting. Would that be fair to say?

19 A Oh yes.

20 Q And that taking a large
21 amount of water from one of these lakes might change
22 the habitat considerably?

23 A Well, I suspect that the
24 amount of water that we expect to withdraw would be
25 recharged with a few possible exceptions where a lake
26 has a very, very small drainage area in a very, let's
27 say, snow-free winter. You might have some -- it may
28 not, in fact, come up to its former level.

29 Q All right.

30 A In general, I would expect

Harlan, Hemstock, McCart,
Williams

Cross-Exam by Bayly

1 that they would be recharged in the spring during the
2 spring melt and that water withdrawal would likely not
3 have much of an effect on utilization by birds.
4

5 Q Is there any way of
6 testing this, Dr. McCart, or is this something that
7 we would just have to hypothesize on? Would you be
8 taking a lake, for example, in your further research
9 and say trying to drain as much out of it as you could
10 to see whether it did recharge?

11 A Well, we hadn't planned on
12 it. I should point out that Dr. Harlan's group, I am
13 sure, could probably calculate the likelihood that
14 a complete recharge would occur during any subsequent
15 spring runoff.

16 Q Have you looked into that
17 problem, Dr. Harlan?

18 WITNESS HARLAN: A Not
19 to this point in time, no.

20 Q And if we go beyond fish
21 and water fowl, we have insects which breed in wet areas
22 in small shallow lakes, etc. as well along the northern
23 coast, is that not correct?

24 WITNESS McCART: Yes.

25 Q And these are insects
26 that may be important both to fish and possibly to
27 some of the water fowl, some of the shore birds, that
28 do count on this area for summer feeding and for
29 raising of their young?

30 A Yes.

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

Q So that we shouldn't really underestimate the importance of any of these lakes simply on the basis that they don't support a fish population? There may be other important uses that different species put these lakes to.

A There are other aquatic organisms living in these things and certainly birds utilize a lot of the shallower lakes. As I said, I think ^{that} /as part of our assessment we would, in fact, I think Dr. Harlan's group is working on -- has met stations in the area, don't you?

WITNESS HARLAN: Yes, we do.

WITNESS MCCART: A In which they are determining such things as storm frequencies, runoff values and things of this sort, or at least they should be able to come up with this kind of information and certainly we would calculate the likelihood that there might be a long term reduction in water level as part of our assessment of particular lakes as potential sources for water.

Q Well, is it possible then, Dr. Harlan, to say, monitor the annual intake into the one of these lakes from spring runoff and storms to give you an idea of how much recharge there is? It will have to be in a particular year because you haven't got time to do it say over a large number of years.

WITNESS HARLAN: A Yes, it is an imperatively easy thing to do.

Q All right. What I am

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

1 concerned with is when you are assessing where you are
2 going to take your water, have you created in Northern
3 Engineering Services or in Arctic Gas in a more general
4 way a check list of things that you must look at to
5 find out what makes a lake acceptable for the taking
6 of water and an assessment of how many things are
7 tolerable before you make a decision not to take water
8 from a particular source?
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Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

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2 WITNESS WILLIAMS: ^{maybe} Before/Dr..

3 McCart answers that, can we put in perspective the
4 quantity that we are talking about, Mr. Bayly? In the
5 response to question 52, it suggests as a conservative
6 estimate, something slightly in excess of a million
7 barrels per spread per season on the north coast. Now
8 this is, this is equal to a one hundred and twenty-
9 nine acre feet. That is a lake, for instance, a hundred
10 and twenty-nine acres in size and one foot depth or
11 ten ponds, each thirteen acres in size, one foot depth.
12 Or two^a/hundred and sixty acre pond, six inches deep.
13 That is respect to lakes. If we are talking about
14 taking it from springs or streams, if you take out a
15 million barrels over a thirty day period, say on a
16 twenty-four hour basis, this is a flow of 2.2 cubic
17 feet per second.

18 It is not a large quantity
19 that we are talking about. A million barrels sounds
20 like a bunch, really it isn't.

21 MR. BAYLY: I realize that,
22 Mr. Williams, but will you agree with me when I say that
23 this is the same kind of problem that we faced with
24 the gravel requirements. There were some areas, where
25 to take even what is a small amount of gravel may be
26 critical because there are other competing uses and
27 they may be animals' use or they may be the use of
28 other people in other projects, and I submit to you
29 that water is the same thing although there may be
30 millions and millions of barrels available to take from

Harlan, Hemstock,
McCart, Williams,
Cross-Exam by Bayly

1
2 North Slope, there may be areas where to take a very
3 few barrels may be very ~~important~~.

4 A Right and we have never
5 suggested that a study of each location where water
6 is to be taken won't be done. It will be done.

7 Q Yes and this is why I am
8 asking Dr. McCart about the check list about sources.
9 Not because I don't think that you are right in that
10 there's lots of water there, but when your evaluating
11 where to get the water, surely there must be some things
12 that you must consider before taking it from a
13 particular source and you must consider that at some
14 point it is too critical to take it from that source
15 and you must look to an alternate source. Now, perhaps,
16 Dr. McCart, you could tell me if this has been the way
17 that you have looked at the use of water along the
18 North Slope.

19 WITNESS MCCART: Absolutely.
20 I might point out that we do not run around with a
21 check list, where we, you know, ~~check off~~ **actual** items
22 or anything like that but as part of your bag and
23 baggages of biologists and particularly in my case as
24 a fisheries biologists, you have a number of things
25 that you keep in mind at all times. Of course, we have
26 been looking at these sources, I might add, for something
27 **like four years** on the particular section of the North
28 Slope that we are talking about and we have a great
29 deal of information about the distribution of fishes
30 in these areas. We have a great deal of information

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

1
2 about the quantities of water. We have a great deal
3 of information about the birds, I not personally, but
4 the bird people and they can certainly comment on areas
5 where they might feel that withdrawal of any significant
6 quantity of water would affect bird populations.

7 Q All right. We
8 face the problem from this point of view, that you have
9 your biologists say, "Here are areas that are critical
10 to the particular species in which we have an interest.

11 And on the other hand, we have
12 Mr. Williams, whose very real concerns are to get
13 enough water in specific locations. Now, having just
14 done a cursory look at the map, it appears to me that
15 a critical area may well be that stretch to the west of
16 Komakuk Beach Camp for the purpose of using water for
17 construction.

18 Certainly, from you have told
19 us at the last time we met on Saturday, there seems to
20 be enough water for the camps, but am I right in sug-
21 gesting, and maybe Mr. Williams can answer this, that
22 in order to build snow roads, the closer you get to the
23 Alaska border, using the borrow sources indicated at
24 52-5 on the map opposite it, there are going to be some
25 quite long hauls if you have a year of very small
26 snowfall.

27 WITNESS WILLIAMS: Yes, and
28 this is an area in which Dr. McCart has done additional
29 work and over near the border on Craig Creek there are
30 two springs identified there, one that has a capacity

1
2 of thirty-six barrels per minute and the other one
3 hundred and twenty-one barrels per minute and in dis-
4 cussion with Dr. McCart, he suggested if this is done
5 properly that there is no reason why water can't be
6 taken from those sources.

7 Q May I suggest to
8 you that in a winter of low snowfall those two springs
9 may be very heavily used by Arctic Gas to avoid the
10 long hauls back to the area of the Komakuk Beach Camp
11 and the Malcolm River.

12 A Well besides the lake at
13 Komakuk Beach Dr. McCart has also identified two
14 springs on Fish Creek, very close to the camp area.
15 One has a capacity of thirty-five barrels ^{per}/minute and
16 the other a hundred and twenty-eight barrels per minute.

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Harlan, Hemstock, McCart
Williams

Cross-Exam by Bayly

1 Q Yes, but really to be
2 practical, Mr. Williams, what you would like to do is
3 have a short haul as possible for this water, is that
4 fair to say?

5 A. Yes, sir.

6 Q And so if given those
7 preferences and if given from Dr. McCart that if you
8 take the water carefully from Craig Creek, the closer
9 you get to the border the more inclined you are going
10 to be to take it from Craig Creek, than to go all the
11 way back to either Fish Creek, the lake near the camp,
12 or to the site on the Malcolm River. It's just
13 practical, isn't it? You don't have to drive so far.

14 WITNESS McCART: Right.
15 Should I put out that we have not found any fish
16 utilization either in the springs, or in the creek
17 vicinity.

18 Q So as far as you're
19 concerned, that's a fairly safe source.

20 WITNESS WILLIAMS: In addition,
21 early in the wintertime maybe some of these other creeks
22 are flowing, or there may be some water in other ponds
23 that aren't identified here when the ice is shallow,
24 thin.

25 Q All right, now you've said
26 maybe there will be. Will these be also ones that are
27 subject to the kind of scrutiny that Dr. McCart has
28 described with regard to other possible users of the
29 stream, be they animal, fish, or bird?

30 A Yes.

Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1 Q And when will you be able
2 to do this so that you do it when you can study the
3 species there? May I suggest to you that it may not
4 be good enough to start doing that the November that
5 you start to do your construction, because many of the
6 species will have left for the season and won't be
7 in evidence?

8 A Well, Dr. McCart has
9 done a considerable amount of this study since the
10 application was written. There is considerably more
11 data available now. I would expect that this will go
12 on.

13 Q All right. Now, the
14 present state of knowledge with regard to fish in the
15 Malcolm River, both from your studies, Dr. McCart,
16 and others that appear to have been done, is that there
17 is no evidence of over-wintering species in that river.
18 Is that correct?

19 WITNESS MCCART: No, there are
20 small numbers of fish, for instance in the spring, which
21 we have identified on the Malcolm River, but we cannot--
22 no one has yet located a major population of ^{anadromus or}seagoing
23 Arctic char on the Malcolm River. We have spent several
24 falls looking for them, have not yet located them. There
25 are, however, apparently small numbers of juvenile fish
26 in the vicinity of that spring which we have identified.

27 Q Now, you have two methods
28 of studying, I gather, to check out a stream and I don't
29 want to go into them too deeply because I am anticipating
30

Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1 that you'll be back to discuss them further in the
2 next panel; but basically you fly over and look for
3 fish from the air, and then you get down on the ground
4 in areas where you anticipate you will find fish, and
5 you attempt to net them to find out say they are
6 salvelinus you want to check to see whether they are
7 sea-going, whether they are females with eggs in them,
8 whether they are juveniles, or what they are. Isn't
9 that fair?

10 A Yes.

11 Q So, I was looking at the
12 chart that you have in Section 14-DM at page 18. That's
13 chart No. 3.7-1, and it takes us to May 1, 1973, and
14 it appears that as far as the coastal region is con-
15 cerned, there are three periods of study on that chart.

16 THE COMMISSIONER: What was
17 that again? 14 --

18 MR. BAYLY: 14-DM.

19 MR. MARSHALL: Exhibit 57.

20 MR. BAYLY: Figure 3, 14-DM.

21 Q Now, Dr. McCart, there
22 appear to be three periods during which you and
23 presumably the other consultants to Arctic Gas did
24 studies on the coast with regard to fish populations
25 there, and in 1972 they are between March 18th and 24th,
26 and May 22nd to October 1st, and November 5th to 12th,
27 and then again going back to -- sorry, that's in 1972 --
28 1973 between April 10th and 19th, and in 1971 two periods
29 or one period, August 10th to 26th, and in 1972 again,
30 just looking at pipeline crossing areas, July 27th to

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

2 September 12th. Now I'm assuming that you've done
3 more since and that the report that -- reports that
4 you have done, one of which you've supplied to me that
5 is to be published later this year is a result of that
6 ongoing research. Would it be fair to say that looking
7 at the number of days that were spent in these studies,
8 and I'm not meaning to be critical at all, but that if
9 there were over-wintering populations in the Malcolm
10 River, that given this amount of time of study it
11 would have been possible that some could have been
12 missed.
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Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

Or wouldn't it be fair
to say that you are satisfied --

A I think it is very
unlikely, you see, because, not only we have looked at
it, the E.P.B. has looked at it. The Federal Fisheries
Service has looked at the thing over a two or three
year period.

You must understand that
anadromus Arctic char have left the Arctic Ocean by
a date somewhere between August 15 and August 20, and
that any survey after that point, if there are signifi-
cant numbers -- now, I'm not saying that there are no
anadromus Arctic char in the Malcolm. I'm saying,
however that there appear to be no large populations.
We certainly haven't found them. Any survey carried
out beyond approximately August 20 would show --
would tell us whether there were significant populations
in there.

We have had a great
deal of experience in looking for these populations.
We've identified, oh, I would say, getting close to
a hundred locations in which Arctic char spawn. We know
what we are looking for. Certainly, if the water is
highly turbid, we may have missed them on a particular
date but we have looked in those streams in August and there
we have looked in September over several years and they
simply is no data to show that these exist in any
significant numbers in the Malcolm River and as I say,
not only work, but no one else has come up with them.

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Williams,
Cross-Exam by Bayly

Q All right. Now, the reason I asked you that question is having read the report that was prepared by Steigenberger and others there is a reference at page 86 of that report at the bottom and the last sentence of this and it is in the section called "Results of Biological Surveys of the Malcolm River". It says "the importance of the head water areas for the maintenance of fish stocks should be reassessed prior to construction".

Just reading that and thinking that Steigenberger is probably a person who does the same kind of work that you do.

A Yes.

Q He feels --

A He spent several years looking for them there and hasn't found them. He still believes that there may be populations up there and there may be. We haven't found them and he hasn't found them. E.P.B. hasn't found them.

Q Yes. But you would agree with him that ^{they} / may be there and that --

A Well, I'm as worried about population in the headwaters of the Malcolm River as I am about populations of the headwaters of the Firth. They will be thirty, forty, fifty, or sixty miles upstream of the pipeline at the time that pipeline construction takes place and even if they are there, which I very much doubt, on the basis of what people have been able to find out about the Malcolm River that they are

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

1
2 not going to be affected.

3 Q All right. They won't be
4 affected by pipeline construction, but is it also
5 possible that starting gravel operations, gravel
6 mining operations late in the summer, may cause some
7 concern to people like you if they are there?

8 A Well, you know, we are
9 worried about, I suppose, I think that the major
10 problem with gravel mining operations is sedimentation
11 of spawning grounds. Now, there is no indication that
12 anything is spawning in the Malcolm River.

13 We would be concerned if
14 the mining operation were carried out in such a way
15 as to cause a constriction in flow and possibly
16 a velocity barrier to the upstream migration of fish.
17 However, not if -- this is not going to occur if they
18 follow our recommendations, certainly not in the Delta
19 or the fan of the Malcolm River which is enormous. I'm
20 sure we can find areas where gravel can be easily taken
21 without damaging fish populations.

22 I don't see this as a
23 serious problem at all. First of all, as I have said
24 repeatedly, there is no evidence of any anadromus
25 populations there in any case.

26 The other piece of infor-
27 mation that we have available to us is that by
28 approximately the end of August upstream migrant Arctic
29 char which are going from the sea up to spawning and
30 over-wintering areas have passed through the downstream

Harlan, Hemstock, McCart,
Williams

Cross-Exam by Bayly

1 ends of these things. The major portion of the
2 population in the Firth River, for instance, is many
3 miles upstream of the pipeline crossing, or any
4 potential gravel mining area by the time that gravel
5 mining would begin there.
6

7 Q Yes. Now, if we compare
8 the Malcolm to the Firth then, in your opinion, and
9 in Steigenberger's opinion, the Firth is a dramatically
10 more productive area for Arctic char than the Malcolm.

11 A Much more so, yes.

12 Q In fact, he quotes you at
13 page 99 of his report as saying that a conservative
14 estimate of the population of Arctic char in the Firth
15 River is between 32,000 and 40,000 fish. He puts in
16 brackets "McCart, 1974, personal comment." Would you
17 agree that that would have been at that time anyway,
18 a conservative estimate of the number of -- ?

19 A I would say it is probably
20 closer if you are talking about -- you have to realize
21 that there are segments of these Arctic char populations.
22 As far as the fish that have been to sea and have
23 moved back upstream, we would place it at probably
24 40 to 60,000 so that would be conservative.

25 Now, I should point out,
26 some of these, of course, are distributed on the
27 American side of the border in headwaters and we have
28 not gone ⁱⁿ and got a good estimate of what is on that
29 side of the border.

30 Q Yes.

A It is difficult of

Q Yes. But as far as -- I
out national boundaries as
a population that needs that

Q Yes. And when you say
s because your equivalents in
g them. Is that right?

Q Right. Now, with regard from the Firth now instead of 1 comment again in Dr. Steigen-
tributed to you on page 99. He
the third paragraph on this page,

"In addition, deep water areas, both upstream and downstream of the proposed crossing site of potential over-wintering areas"

and he attributes that to Craig and McCart, 1974. And

You would agree with that?

Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1 WITNESS McCART: It is that
2 area, potential area, shown in our report, figure 10.
3 At that time we thought there was probably over-wintering
4 in the vicinity; since then we have narrowed this down
5 and we find out that the potential over-wintering
6 areas shown as No. 42, they are in fact downstream
7 of the pipeline crossing and are in fact in that spring
8 which we listed for this Inquiry last week.

9 Q Yes, that's an important
10 aquifer with nitrogen bubbles coming out of it?

11 A Yes, and as I say, we have
12 refined our information and find it is downstream. We
13 have no evidence of any over-wintering at the pipeline
14 crossing. In fact in the years which we have looked at
15 it, it's been frozen to the bottom at the pipeline
16 crossings in winter.

17 Q All right. One of the
18 concerns that again is expressed in this report at
19 page 100 under "Construction considerations" and there
20 are three construction considerations given here, the
21 first one being -- and I'll read part of it to you:

22 "The trenching operation may intersect sub-
23 gravel waterflows that are maintaining fish
24 populations further downstream during the
25 winter."

26 I would suggest to you then that his fear is that even
27 if the river is frozen to the botton, that underneath
28 there may be some water flowing that may be going into
29 areas in which fish are over-wintering.

30 A Yes, and I think we've

Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1 stated possibly eight or ten times over the last week
2 that we will be looking at situations where there are
3 spring orifices downstream to see whether in fact we
4 do intersect aquifers.

5 Q All right, and that will
6 be the result -- I mean that will result in a drilling
7 program or something of the sort in subsequent
8 seasons prior to final design.

9 A That would be the result
10 of the --that information would be the result of the
11 drilling program, yes.

12 Q Is that something you
13 will be doing this winter, Dr. McCart? Or perhaps
14 Dr. Harlan?

15 WITNESS HARLAN: Yes, it will
16 be a combined geophysical survey and drilling program.

17 Q And provided we take longer
18 than we expect, that information will be available for
19 this Inquiry?

20 A Yes, it will.

21 Q In fact this concern goes |
22 on, Dr. McCart, and I'm leaving out about two sentences.
23 I believe this report is an exhibit and perhaps we
24 could supply you with a copy of it because you may feel
25 that I've left out something unfairly.

26 WITNESS MCCART:
27 Well, I brought a copy
28 last week but I failed to bring it this one, unfortun-
ately.

29 Q I see we are unable to
30 find a copy, and perhaps Dr. McCart, if I were to read

Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1 you the sentences in between as well, so that I'll take
2 up where I left off:

3 "Alternate construction techniques and/or special
4 trenching methods should be investigated to pre-
5 vent excessive overflow and decrease sub-gravel
6 waterflows, excessive ice buildup and increased
7 sedimentation during the critical winter period.
8 These events may influence the survival of fish
9 and/or fish eggs, the timing of breakup and
10 the migration of fish. Sedimentation during the
11 winter must be kept to a minimum during the winter
12 and year- round erosion of the right-of-way must
13 be low enough to reduce the productivity of the
14 invertebrate food sources that maintain the fry,
15 juvenile and adult life stages of fish
16 populations that utilize the delta during dif-
17 ferent times of the year."

18 Now, there are a number of concerns in that paragraph
19 and I'm wondering, having heard those, whether those
20 would be ones that you would agree should be important
21 in the minds of Arctic Gas ^{when} / planning the crossing of
22 the Firth River?

23 MR. MARSHALL: Mr. Commissioner,
24 Dr. Fyles and I have checked and we can't seem to find
25 the report being referred to as having been entered as
26 an exhibit.

27 THE COMMISSIONER: This Steigen-
28 berger Report?

MR. MARSHALL: Yes sir.

THE COMMISSIONER: I don't know

Harlan, Hemstock, McCart
Williams
CrossExam by Bayly

1 where it came from but I'm looking at one while Mr.
2 Bayly's been speaking, and I assumed since it was on
3 my table it had been marked. Maybe it hasn't been.

4 MR. SCOTT: Dr. Fyles says he
5 thinks it was marked at Whitehorse.

6 MR. BAYLY: That's my recollec-
7 tion, Mr. Commissioner. It's just that we don't have
8 the benefit of Miss Hutchinson, who could probably find
9 it in a moment for us.

10 THE COMMISSIONER: Well, at
11 any rate --

12 MR. SCOTT: If it isn't marked
13 perhaps it should be and we can check with Miss Hutchin-
14 son when she returns.

15 THE COMMISSIONER: All right,
16 well let's do that when she returns. Is there any
17 problem about Mr. Bayly referring to it?

18 MR. MARSHALL: No, I think that
19 Dr. McCart might want to look at it. He might have a
20 better memory than I do. I'm sure he does, but he might
21 want us to have --

22 THE COMMISSIONER: He might
23 have a better memory than Mr. Steigenberger about the
24 things he told.

25 MR. BAYLY: Perhaps, Mr. Commis-
26 sioner, if there's something that Dr. McCart wants to
27 refer to that he recalls being somewhere else in the
28 report --

29 THE COMMISSIONER: You can use
30

Harlan, Hemstock, McCart
Williams

Cross-Exam by Bayly

1 mine. It's just --

2 A No, I can respond to that
3 statement. That is a God and motherhood statement. Every
4 fish biologist would say exactly the same thing. Cert-
5 ainly these are our concerns. We have mentioned them
6 in various places in Volume 15 that these are concerns.
7 We have mentioned them in the application that these
8 are our concerns. They're everybody's concerns.
9 Certainly this is part of the check list, this baggage
10 that we carry around with us to which we are mentally
11 at least referring whenever we're trying to assess the
12 water source, or a mining area.

13 THE COMMISSIONER: When Mr.
14 Bayly was reading that I must say my reaction was
15 very much the same as your own because he says, whoever
16 this is, Steigenberger or -- he says:

17 "Alternate construction techniques and/or
18 special trenching methods should be investigated
19 to prevent,"
20 all of these things. That really doesn't get us very
21 far because no one seems to be -- no one has addressed
22 the whole question what are alternate construction
23 techniques and --

24 MR. BAYLY: I was just about
25 to ask Father Williams about the motherhood problems,
26 Mr. Commissioner.

27 THE COMMISSIONER: Well, Dr.
28 Harlan is anxious to get in on this.

29 WITNESS HARLAN: I think it's
30 worthwhile pointing out that although your trenching

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Williams
Cross-Exam by Bayly

1 operation may go through one of these aquifers, you're
2 not affecting the permeability of/^{the}material in that you
3 will have enough water in the ditch to prevent freezing
4 of the sub-strait material; and secondly, you're not
5 changing the hydraulic gradient on that aquifer sign-
6 ificantly.

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

1
2 THE COMMISSIONER: Would you
3 mind repeating that? We have gone from God and mother-
4 hood to something rather more specific and I wanted to--

5 WITNESS HARLAN: Okay. If in
6 your trenching operations, you happen to pass through
7 one of these shallow aquifers, okay the ditch in effect
8 will fill with water and there will be a small amount
9 of earth, some seepage to the surface. But because
10 this is occurring, your not going to freeze off the
11 aquifer. You are also not going to modify the
12 permeability of the aquifer. Okay, further, your not
13 going to change the hydraulic gradient, the driving
14 force for the ground water flow. So, at ^{least} / in my view
15 that it is very unlikely that you would have a sig-
16 nificant effect on flow in that aquifer which is
17 important to downstream over-wintering fish.

18 MR. BAYLY: All right now Mr.
19 Williams--

20 THE COMMISSIONER: Excuse me.
21 This paragraph begins with the sentence, "The trenching
22 operation may intersect sub-gravel water flows that are
23 maintaining fish populations further downstream during
24 the winter". Your saying that he shouldn't be worrying
25 about this, that the things you propose to do, will
26 prevent this?

27 WITNESS HARLAN: Yes, and
28 because you are not modifying the permeability of the
29 aquifer or changing the hydraulic gradient, I think it is
30 reasonable to expect there will be very little effect on

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the ground water flow. Okay, that is important to the downstream over-wintering fish. For example, if you were gauging the spring at the upper end of a pool in which the fish are over-wintering, I think you would find there would be very little fluctuation in the discharge from that spring during the pipeline construction phase.

THE COMMISSIONER: All right, that is during construction. Not that I want this to turn into a substantial digression but once you have installed the pipeline and chilling begins, then you may very well alter the, what I think you call the thermal regime and you would interrupt the flow of the aquifer.

WITNESS HARLAN: Yes. The degree to which we would interrupt it depends on a number of factors. One, the ground, the rate of water flow, the quantity of flow involved, the thermal environment in which we are dealing, what is the temperature of the water--

THE COMMISSIONER: But the remarks you just made a minute ago are confined solely to construction?

A That is correct.
Q Frost heave aside?
A That is correct.
Q Okay.

MR. BAYLY: Now, Mr. Williams, we have been referred by the-- Before I ask that

1
2 question Mr. Commissioner, I have been informed by
3 Miss Hutchinson that really this isn't an exhibit and
4 perhaps it should be marked as one. I see you have a
5 copy. Perhaps at some point that copy could be marked
6 as an exhibit.

7 THE COMMISSIONER: All right.
8 Well, this one could be marked.

9 MR. BAYLY: It doesn't have
10 anybody's name on it. Mr. Williams, are there alternate
11 trenching methods that could be used to diminish or
12 minimize any of the problems referred to in
13 Steigenberger's concerns?

14 WITNESS WILLIAMS: There are
15 a couple that come to mind, Mr. Bayly. First of all
16 you would have to identify the problem and in this
17 study it might determine that some period during the
18 five month construction period, it is better to do it
19 than some other period.

20 From that study you would
21 pick the proficuous time to undertake the work. The
22 river crossing itself can be left to-- It doesn't
23 have to go on as the pipeline spread goes through. It
24 can be left, or if you have snow roads in it could be
25 done earlier. And in a wide, wide flood plain river
26 like the Firth or the Malcolm it doesn't necessarily
27 have to be done all at once, particularly if there is,
28 if the stream is frozen to the bottom in segments, in
29 channels, various channels, You could do part of it,
30 backfill that part and then continue on with another

1
2 segment and backfill that if that's going to help the
3 problem. It's a study. There are things like this
4 that could be done but a modified trenching technique,
5 I am not sure of, I think generally speaking you like
6 to get it excavated and backfilled as quickly as
7 possible.

8 MR. BAYLY: What about in a
9 river like this which is obviously an important fish
10 river and has even at times supported some commercial
11 fishing? Is it possible to cross a river like this
12 above ground in a overhead crossing?

13 A It's possible. In our
14 opinion, but it is undesirable.

15 Q All right. If the crossing
16 were relocated above the flood plain fan at the north
17 end, would that make the possibility more realistic?

18 A Are we speaking of the
19 Firth now, or the Malcolm, or any river in particular.

20 Q I am thinking of the Firth,
21 because it appears from what Dr. McCart has said that
22 this is, as far as a breeding area and an over-wintering
23 area for Arctic char, a more significant river than
24 any other we have discussed on the North Slope in terms
25 of numbers.

26 WITNESS MCCART: You know this
27 is the problem you run into if you start talking about
28 putting a gravel pit at New Westminster that might
29 affect the salmon populations at Shuswap Lake. It is
30 true that it is an extremely important over-wintering

1
2 and spawning river, but that the, we have done extensive
3 studies in that. We spent several years galloping up
4 and down there, we spent thousands and thousands of
5 dollars on helicopter time to establish that the major
6 over-wintering and spawning populations are far upstream
7 of that pipeline crossing with the exception of that
8 minor spring in the fan and the spring between the
9 Firth and the Malcolm, areas that we are very much
10 aware of, but they are far distant from this particular
11 area.

12 MR. BAYLY: All right.

13 WITNESS McCART: And you could
14 go to great lengths to put a bridge across it and so
15 forth and you wouldn't, you would probably do more
16 damage to Arctic char populations putting in an over-
17 head crossing or bridge or whatever, than you would if
18 you simply left the dam thing alone and buried the
19 pipe in the bottom.

20 Q All right. But let's look
21 at this from just a purely practical trade off kind of
22 perspective. Is it fair to say that if you build the
23 crossing the way that you would anticipate building
24 it at present across the Firth, that you do stand a
25 chance of killing some over-wintering fish. But, let
26 me finish this, because I don't want you to get all
27 panicked, but that if you do you don't think that you
28 are going to kill enough to make a significant difference
29 to the population?

30 A Yes. I would agree with

1
2 that. There is always the chance. I think we can
3 minimize the chance but there is always some probability
4 however small that some fish will be killed and yes,
5 I also agree that because this is only a minor segment
6 of the population that is below the pipeline crossing,
7 as far as we can determine, it is almost exclusively
8 juvenile pre-smolt fish, in other words fish that have
9 never been to sea and only a small segment of the total
10 population of this particular life history group in
11 that stream, that the loss of even a few thousand of
12 these things would have no significant effect of the
13 population, the survival of the population or except
14 on a very short term basis, the size of the fish
15 population in the Firth River.

16 Q And that would it be fair
17 to say that either the siltation or the frost bulk
18 problems caused by crossing the river where it is
19 intended to cross, would be something that would be of
20 a single seasons duration ^{and} no longer than that?

21 A No, I say that if in fact
22 there were a frost bulk problem and if in fact this
23 water that feeds that spring further downstream were
24 brought to the surface early because of the fact that
25 you have a pipeline across an aquifer, that this would
26 be something that would continue possibly for the length
27 the life of the pipeline, and certainly we are aware
28 of the existence of this spring and we are going to do a
29 drilling program to find out whether it in fact might
30 be a problem.

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1 Q So the worse case
2 is that this particular spot
3 possibility/where a small percentage of the juvenile
4 alpinus
5 salvelinus/do their over-wintering might be unavailable
6 for the lifetime of the facility.

7 WITNESS McCART: There is a
8 probability if in fact --

9 Q I just put it it's
10 entirely possible.

11 A -- if in fact no
12 mitigative measure is possible.

13 Q Yes, and I just put that
14 as a worst case possibility. Would you agree with that?

15 A As a worst case possibility
16 there's a very small probability, I think, because
17 everybody is now aware that there is a spring downstream
18 and certainly it's going to have to be looked at.

19 Q Yes, I went through
20 those kinds of problems with Dr. Clark and his erring
21 on the conservative side. Now, regarding just
22 aquifers in general, Dr. Harlan, just before we leave
23 this subject, when you gauge an aquifer you can expect,
24 I suggest, that in different years you will get
25 different amounts of flow depending on the amount of
26 groundwater that is feeding it. Is that correct?
27 In a dry year with very little rainfall and very little
28 snowfall the year before, the aquifer may produce
29 less or fewer barrels per minute than it might in a
30 wet year.

WITNESS HARLAN: The question
is more complex than you probably recognize. There are

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1 aquifers of very limited aerial extent. These will be
2 quite dependent upon the climatic conditions that exist
3 say in any given year. There are also aquifers of
4 large aerial extent and flow in these aquifers is almost
5 independent of the immediate climatic conditions.

6 Q All right, when you say
7 "immediate", would that mean that you --

8 A Within the last several
9 years.

10 Q -- you'd have, say
11 several years of extraordinarily dry climate conditions
12 to affect them at all?

13 A On these there would
14 probably be decades of long or dry periods.

15 Q Yes.

16 A Before they were affected
17 For example, if we're dealing with the Mackenzie
18 Valley, there appears to be a regional flow system that
19 flows from the Mackenzie Mountain beneath the Mackenzie
20 River and discharges both in the Franklin Mountains and
21 along the western edge of the Canadian Shield. O.K.,
22 flow systems of this size are quite independent of well
23 say precipitation over a short period of time, say five
24 years of precipitation probably does not affect signi-
25 ficantly the groundwater discharge.

26 Q And are you able to
27 distinguish these when you say "a large area", I gather
28 that means a large acreage, square footage or whatever?

29 A Yes.

30 Q It also, I assume, has

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1 something to do with depth because we were concerned
2 in the one instance with the size in terms of depth of
3 the aquifer, and not so much the square footage.

4 A That's correct, yes.

5 Q And you can classify them
6 then into deep or major aquifers, and --

7 A In a very local source,
8 yes you can.

9 Q -- and local small ones.

10 A Yes, this is also very
11 apparent in the water chemistry as well.

12 Q All right, so that the
13 ones with peculiar things like lots of nitrogen and
14 perhaps a fair amount of salination are ones that you
15 may consider to be larger and more significant than
16 others that may depend on local runoff?

17 A That is correct, yes.

18 Q Now, if we refer to page
19 33 of your prepared evidence, you deal there with water
20 for the use of camps. Now under 33, paragraph with a
21 No. 1, you say that the water for camps shall be clear,
22 sparkling and devoid of taste, odor, or harmful bacteria
23 and be within specified chemical quality criteria.
24 In order to achieve that, I'm assuming that you will
25 have to add something to the water, or subtract some-
26 thing from it. I assume, though, that usually water
27 is treated by adding chemicals to it. What sorts of
28 chemicals would you envisage adding to the water to
29 create this tasteless invisible substance to feed to
30 the construction workers?

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WITNESS WILLIAMS: Associated
Engineering have covered this in a report, Mr. Bayly,
and it might be a good question for Mr. Lawrence on the
Foothills panel.

Q All right, and he's the
consultant to Arctic Gas in the same area?

A Yes sir.

Q Well then --

WITNESS McCART: It's fairly
standard, I think, to use activated charcoal to remove
taste odors, etc. etc., and this is not going to have
any effect on the water.

Q Yes.

A You know, this is/ ^{something} that
one does with city waters and you can put fish in it,
as a matter of fact.

Q Yes, although you have
to wait a couple of days with tropical fish, I understand,
before --

A Not if you use activated
charcoal, I don't think.

Q There are, however, as I
understand, in certain municipal water supplies things
like chlorine that are added for the killing of certain
bacteria. Is that correct?

A Oh yes. That is after
we had removed the odor; I would presume.

MR. BAYLY:

Right. I 'm prepared to
defer these questions, Mr. Commissioner. I would like
to check ^{though} / with Mr. Gibbs to make sure that he

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1 doesn't mind me asking Arctic Gas questions of his
2 witness.

3 MR. GIBBS: I hadn't realized
4 we were going to lead evidence for Arctic Gas; if Arctic
5 Gas needs our help we'll be glad to do it.

6 MR. BAYLY: Q Dr. McCart, I'm
7 referring now to the Biological Report series, Volume 15
8 at Chapter 3, I believe, yes, Chapter 3, page 2. Do you
9 have that? There's a chart on that page and have you got
10 that page before you, sir? In that you have identified
11 a number of areas which you say in the paragraph above
12 the chart:

13 "The following table lists the drainages which
14 have been surveyed to date and indicates whether
15 or not there are areas within them which might
16 be critical in the event of winter construction
17 of a gas pipeline. Among those are some of the
18 rivers we have been discussing, starting with
19 Fish Creek and going as far as Cache Creek along
20 the North Slope."

21 A Yes.

22 Q And going down the chart,
23 there are pluses under the present column where there
24 are critical areas present, in your opinion, and blanks
25 where there aren't any, or pluses where there appear to
26 be none with the exception of the Malcolm, which has a
27 question mark, and I'm gathering the Malcolm question mark
28 has to do with this problem of whether or not there may
29 be some fish that have been missed in the Malcolm River.
30 Is that correct?

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1 A Yes.

2 Q And with regard to the
3 pluses, in the present column do they all concern fish?
4 In other words if they are problems --

5 A "Fish Populations" is the
6 title to the report, yes.

7 Q And what's the significance
8 of saying:

9 "Winter construction."

10 Is there an opinion you have that summer construction
11 in this area might in some ways be preferable?

12 A No, this refers to the
13 fact that we have classified, Craig and myself, streams
14 along the North Slope into three very very general
15 sorts of groups, the mountain streams and the spring
16 streams, which are the spring-fed ones, plus the
17 tundra streams. The tundra streams generally only run
18 during the spring. These are the springs in which
19 grayling typically spawn. In this instance we're talking
20 only about the streams in which there is water and as
21 a potential for over-wintering and spawning of fish
22 populations during the winter when construction was
23 planned. In general we prefer winter construction.

24 Q All right, so we're only
25 looking in the plus columns at those rivers where there
26 may be downstream sites like the one identified in the
27 Firth where there might be some possible damage to an
28 over-wintering area, or a spawning area.

29 A Well, we also included
30 in there upstream critical areas too. We didn't confine

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Cross-Exam by Bayly

1 ourselves with those strictly downstream.

2 Q All right.

3 A Anywhere where we felt
4 there was a critical area, anywhere upstream or down-
5 stream.

6 Q Now, what sort of upstream
7 problems might you contemplate?

8 A Well, the construction
9 itself, There is a possibility, as I said before, of
10 a constriction in flow which creates a velocity barrier.
11 Now the present construction plan, I don't see how this
12 would happen during the winter construction of this
13 particular pipeline. The other thing is, of course, that
14 by having people on the scene you're providing access to
15 areas. People can helicopter over to a critical area
16 and fish in these areas, They are open all winter
17 long, I might point out, there's open water there and
18 in some instances the fish are available all year-around.

19 Now, we made a recommendation
20 to Arctic Gas and it's included in our application that
21 we will not permit fishing by construction personnel
22 in order to counter this particular problem.

23

24

25

26

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Cross-Exam by Bayly

1
2 Q All right now, is it not
3 also true that there may be some interesting upstream
4 effects if gravel, for example, is mined from an active
5 streambed which causes a change in the gradient which
6 will cause either increased upstream erosion or increased
7 bed load until the river has reached its natural though
8 lowered equilibrium?

9 A It is possible, but in the
10 particular instance we are talking about, I don't see
11 this again as being a problem.

12 Q All right. This is a
13 concern, I understand, of the Environment Protection
14 Board and I don't know whether you are aware of it but
15 I'm referring to Volume 4 of the E.P.B. assessment under
16 research reports and the report prepared by Unies for
17 the Environment Protection Board where they refer to
18 river channel stability. Perhaps that volume could be
19 provided to you and you could have a look at page 202.

20 WITNESS HARLAN: A Perhaps
21 I can comment on this.

22 Q Could you synopsise it as
23 well for the sake of the Commissioner because the
24 exhibit copy is the one that you have, so we don't have
25 one for him as well?

26 A I had better read it first
27 then.

28 Q All right. Well perhaps
29 I can supply him with my copy because I have been over
30 it.

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Mr. Commissioner, mine has
some notes and lines if you would just try to ignore
those.

THE COMMISSIONER: Okay, thanks.

WITNESS HARLAN: A In our
evidence, we have stated that borrow operations on
graded rivers, that in these situations the depth of
gravel removal will not be below the level of the
natural streambeds, so this would suggest that we're
taking just a very shallow layer of gravel off of
these graded rivers. Okay, this process will result
in a potential for the redistribution or movement of
settlement -- sediment -- upstream of the pipeline,
down in deposition over where we removed the gravel.

Okay, this will occur
mainly during the spring periods when natural sediment
loads are high. So, it would be my opinion that the
effect would be very minor.

Q All right, now, a lot of
this, whether it would be minor or not depends on how
you level off the bottom of the gravel pit. Isn't that
true?

A Pardon?

Q A lot of the effects will
depend on how you level off the bottom of your gravel
pit. For example, if you are to level it off level so
that if you put a spirit level on it, it read that it
was level, then at the upstream end, you would have, if
you like, a small cliff face whereas at the downstream

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Williams
Cross-Exam by Bayly

1
2 end you might have it even with the riverbed. If you
3 are going to do it to avoid this problem may I suggest
4 to you that you must -- as much as possible -- level
5 it so that it is equivalent to the stream gradient that
6 exists in the normal water course.

7 A Yes, I would agree with
8 You. I think that has been stated in our evidence that
9 we will create a flat surface or graded surface so that
10 it is flat with a positive gradient in a downslope
11 direction.

12 Q All right. You do say, of
13 course, the -- even though it is in the active flood
14 plain and therefore not where water is flowing at the
15 time that you take the material, you do face the fact
16 that upstream material will be deposited in the gravel
17 pit areas which may cause an increase in bank erosion
18 upstream as well as increased --

19 A I would think it would be
20 more an increase in bed erosion upstream.

21 Q Yes. But in order that
22 bed erosion and bank erosion aren't isolated, it
23 matters, I submit to you that if you lose some of the
24 bed and therefore have a deeper narrower channel which
25 will flow more quickly and you are going to get some
26 side erosion, especially where you have bends in the
27 river.

28 A Yes. That's true.

29 Q So that there will be some
30 bank erosion and so that some of the sedimentation

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Williams,
Cross-Exam by Bayly

1
2 increased sedimentation may continue past the flood
3 period?

4 A I think there are
5 instances where this could be true, yes.

6 Q And so --

7 A These would probably
8 be very minor though. And probably of little signifi-
9 cance.

10 Q Depending on the size, of
11 course, of your gravel mining operation.

12 A Size in terms of aerial
13 extent, not in terms of earth.

14 Q Yes.

15 A Yes.

16 Q Aerial and depth?

17 A Well, the depth would have
18 a much greater influence than size.

19 Q Yes. Even the area is
20 going to cause -- the larger/^{the} area, the more material
21 is eventually going to be transported to cause the stream
22 to try and find a natural gradient even though lower
23 than its original profile?

24 A I'm not sure if --

25 Q That's the way I read the
26 conclusions in the Unies' Report and you are a man who
27 is an expert in this field. You may be able to shed
28 more light on it than I would.

29 WITNESS McCART: A Perhaps
30 while he is reading, I could make a comment. I am not

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1 aware of any instance in the literature where gravel
2 borrow operations in an active flood plain carried out
3 as they are proposed to be carried out has ever
4 in fact caused an interruption in the migration of fish.
5 We have had some, you know, horrendous activity in
6 placer mining in the vicinity of Fairbanks and I have
7 read accounts of this sort of thing, but I have never
8 seen any indication that the migration of the channel
9 or anything of this nature has put a stop to upstream
10 migration of fish.
11

12 Q Yes, I am not suggesting,
13 Dr. McCart, that we're faced with a case of the
14 blockage of migration of fish. I am only suggesting
15 that the increased sedimentation may last longer than
16 the spring flood period because it may take longer than
17 that for the channel of the stream to find its natural
18 equilibrium.

19 WITNESS HARLAN: A Well, I
20 think it is reasonable to expect that this process will
21 occur over a number of years, not just over a single
22 year.

23 Okay, but the transport
24 capability of the river itself is a function of the
25 gradient and the volume of the water. So it would have
26 its greatest potential for transporting sediment during
27 the spring runoff, or say during flood events.

28 Q Yes, I can agree with you
29 there but it may go on, as you say, for more than one
30 season. We are not looking at one event to restore

Harlan, Hemstock, McCart,
Williams
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1 the river to its natural equilibrium although at a
2 lower profile.

3
4 A That is correct, yes.

5 Q And this effect would
6 depend on your not digging below the level of channels
7 which are active at the time of the taking of water.

8 A Yes. The effect would be
9 minimized by not going below the level.

10 Q Yes. Would you say--

11 A The effects would be much
12 worse if we had a, for example, a very, fairly small
13 borrow pit but quite deep. That would be the worst
14 situation.

15 Q Yes. And then we do face
16 the specter that Mr. Scott raised of doing your gravel
17 mining in an active flood plain in which there is no
18 flow at the time that you take it. How do you determine
19 whether you have gone deeper than you should have?

20 A I would think this is a
21 very simple matter of surveying it.

22 Q All right.

23 A Now, it is also indicated
24 by the position of the water table.

25 Q So as soon as you find
26 water, that is the time to stop?

27 A Yes.

28 Q All right, but that may be
29 not necessarily be at the lowest -- That may be below
30 the level of the normal water course when there is

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Williams

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1 water in the active streambed.

2 WITNESS WILLIAMS: A Well,
3 this would all be determined in the development, in
4 the survey done for the development plan, Mr. Bayly,
5 that we've talked about many times.
6

7 That would be part of the
8 survey that would go on ahead of proposing such a
9 development.

10 Q What season could carry
11 this out in, Mr. Williams, to guarantee that you were
12 avoiding the problems that Dr. Harlan and I have raised?
13 In other words, if you carried it out in September
14 when there is no water flowing, say, in the Malcolm
15 River in the north end of the flood plain?

16 A The bottom of the stream-
17 beds would still be well defined in September.

18 Q Yes. And those particular
19 streambeds, as they exist, would that mean you wouldn't
20 go below them?

21 A Yes.

22 Q Because, you see, I have
23 got the two answers -- I have got the answer that you
24 would go to the headwater and I have got your answer
25 that you would go to the bottom of the last active
26 channel.

27 A There is a contradiction
28 in there.

29 Q Yes.

30 A It is different than what

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1
2 we said last week, I think.

3 Q All right.

4 A Because we concievably
5 would go below -- slightly below -- water level but
6 not below the bottom, the depth of the deepest channel.

7

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Williams
Cross-Exam by Bayly

1 Q So you would survey the
2 flood plain looking for the deepest channel, and when you
3 found the depth of that, that would be the maximum
4 depth in the gravel deposit that you would go?

5 A I said deepest. There's
6 some judgment in there, if there's several channels,
7 that would be a judgment.

8 Q That does assume that
9 rivers have uniform channel depths though, doesn't it?
10 I envisage certain rivers that have deep spots and
11 shallow spots that don't necessarily depend on how
12 far up or down the river you are. How do you determine
13 from that? Do you take a mean, or do you take the spot
14 closest to where you are doing your mining operation,
15 or what?

16 A My observations of those
17 northern braided streams, is that you don't have that
18 to the same extent as a silt bottom, silt, or different
19 material. It's all gravel.

20 Q I realize it doesn't
21 exist to the same extent, Mr. Williams, but you do
22 get what is sometimes called the boulder apron at the
23 bottom of a fast-flowing part where the water upstream
24 of that is deeper and the boulders or cobbles or what-
25 ever you want to call them are deposited below that
26 where the water has slowed down somewhat, and you do get
27 a variation. It may not be a very significant amount in
28 terms of tens of feet or anything, but it may be several
29 feet in some instances. Would you agree with me there?
30

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Williams

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1 A I would say less than five
2 on these northern streams.

3 Q Yes, but it could be -

4 A There would be some
5 judgment required.

6 Q -- but it could be several
7 feet, three or four feet.

8 WITNESS McCART: Could I
9 make a comment here? Now we're only talking about
10 taking gravel out of braided streams. Now braided
11 streams are braided streams because of course the
12 active channel actually gallops around in the case
13 of the Firth River, it may be 20 miles away one year
14 as to what it was the next, and ^{that} if we're concerned about
15 encouraging movements of gravel that are a little bit
16 unnatural, the sorts of things that arise as a result
17 of the natural processes in braided streams and the
18 reason that they are braided streams are far in excess
19 of anything that we could expect to do by removing
20 some gravel from an active channel -- or sorry, active
21 flood plain at some considerable remove from the
22 channel.

23 I should also point out that
24 fish normally do not spawn, if we're concerned about
25 that, in areas where there's a great deal of uncertainty
26 of this kind. They are going to spawn in areas where
27 they can be assured, if I can be anthropomorphic, that
28 there's going to be water next year and certainly in
29 one of these fans it would be the last place in the
30 world where you'd expect to find a spawning population
of fish or even a large over-wintering population.

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Williams
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1 Q Yes,

2 A So that you're worrying
3 about something here that might be a problem if you're
4 talking about a channelized stream somewhere along the
5 Mackenzie Valley, but it is, you know, really unlikely
6 to have any significant effect at all in a braided
7 stream on the North Slope.

8 Q Well, Dr. McCart,
9 in a sense isn't that kind of a red herring, because
10 you're concerned as well with the areas up and down-
11 stream of the borrow areas, it isn't just that the
12 fish may spawn right where you're going to put in your
13 gravel trucks. It's that--

14 A Yes, but the areas that
15 I'm concerned about, the areas in which there is some
16 stability in which there is over-wintering flow year
17 after year, in other words not areas which are braided,
18 but areas where there's an orifice on a consistently
19 flowing perennial stream, downstream of that area.
20 That's what I am concerned about, and certainly we
21 wouldn't want any kind of a gravel pit anywhere in the
22 vicinity of those things.

23 Q Yes, or there may be
24 some areas upstream that will have increased siltation
25 because there has been an increase of movement of
26 material to fill up whatever the holes are.

27 A There's a sort of
28 maximum. You've got to be talking I think probably
29 in terms of a mile or so as the maximum upstream extent
30 to which you would find this kind of thing occurring,

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1 and I can't think right now offhand in the Yukon
2 Territory of a critical area within that distance upstream
3 of our crossing points, or from the areas from which
4 it is anticipated that we would remove gravel. I really
5 think that the whole question is a red herring as far
6 as river channel stability goes, because you don't have
7 any river channel stability in a braided stream.

8 Q So you are telling me that
9 you'd be satisfied as long as there wasn't a fish
10 over-wintering spot within a mile upstream of a gravel
11 mining operation in a braided stream?

12 A I'm not saying that; I'm
13 saying I don't know of any over-wintering populations
14 within a mile upstream.

15 Q All right, but you also
16 said that you wouldn't be concerned if the phenomenon
17 I've suggested that the E.P.B. is concerned with
18 happening more than a mile upstream of any gravel
19 mining operation.

20 A I would say a mile or
21 so. I'm not a river hydrologist and I can't -- but you
22 know, it's difficult for me to conceive of this sort
23 of thing happening. I've watched them move gravel from
24 the Sagavanirtok River since 1969, and I haven't seen any
25 upstream migration of those gravel pits or any kind of
26 horrendous situation that has resulted from changes
27 in gradient as a result of those mining operations which
28 are very, very, very extensive and cover square miles
29 of the Sagavanirtok Delta. It just seems to me to be,
30 you know, very much a red herring with respect to

Harlan, Hemstock, McCart,
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Cross-Exam by Bayly

1 braided streams. If we were talking about gravel pits
2 in the active flood plains, single channel streams
3 somewhere, it might be a very great concern; and I might
4 add another thing, that we would want to be assured,
5 incidentally, by a hydrologist who are assessing gravel
6 pits, that there wasn't any likelihood of the sort of
7 bank erosion that you were mentioning earlier on.

8 Q So bank erosion is some-
9 thing that you're concerned with as well.

10 A Yes, and again in a
11 single channel stream if you take a bite out of the
12 bank certainly you're going to encourage migration;
13 but not in these braided streams.

14 Q All right, and so if
15 this concern of the E.P.B. that there may be bank
16 erosion caused by borrow so that the stream can find
17 its natural equilibrium again, you think that that's
18 not a valid concern of theirs.

19 A Certainly it's valid,
20 but not for the North Slope where we are planning on
21 taking gravel. We're not planning on taking gravel
22 from stream beds along the Mackenzie River, as far as
23 I know.

24 Q All right. What concerns
25 me, sir, Dr. McCart, the reason I bring this up is
26 not because it's an idea of mine but because their
27 concern is the North Slope braided river channels,
28 and --

29 THE COMMISSIONER: Excuse me,
30 just so I'm with you, Mr. Bayly, I have followed Dr.

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Williams
Cross-Exam by Bayly

1 McCart. In a question Miss Minning told us last week
2 that they were going to take gravel essentially from
3 these flood plains on the North Slope for purposes of
4 obtaining gravel for construction on the North Slope;
5 but in this page, 202 of Volume 4 of the E.P.B., do
6 they say that they are concerned about the problem on
7 the North Slope?

8 MR. BAYLY: Not on that parti-
9 cular page, Mr. Commissioner, but I believe it's found
10 in their conclusions and recommendations and you have
11 my volume so I don't have that before me.

12 Q Now, Dr. McCart, I've
13 just looked at a question that I'm going to leave until
14 the next panel. Dr. McCart, if we look at Volume 15 --

15 MR. SCOTT: Perhaps we can just
16 clarify something. I understood Miss Minning to say
17 that there were none on the Mackenzie River Valley,
18 that is no flood plain gravel mining on braided rivers
19 on the Mackenzie Valley. Our recollection is that there
20 are in fact two listed as alternates. Perhaps Mr.
21 Williams could check that when he has a moment this
22 week. We may have misread them.

23 WITNESS WILLIAMS: Are these
24 alternatives?

25 MR. SCOTT: Second choice.

26 A In tributaries to the
27 Mackenzie, Mr. Scott?

28 MR. SCOTT: Yes, they are.

29 A I'll have a look.
30

Harlan, Hemstock, McCart
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Cross-Exam by Bayly

1 MR. BAYLY: Q Referring to this
2 report again, just to show you the concerns that the
3 Environment Protection Board expressed here, they are
4 found at pages 184 and 185 under:

5 "Summary and Conclusions."
6 Referring ^{to page} / 185, the first column approximately half-
7 way down, their concern was -- and I'll quote it:

8 "River borrow operations which remove a large
9 fraction of the gravel being transported by the
10 river would cause noticeable changes in the
11 frequency and extent of bank and bed erosion.
12 In such cases, sediment transport rates and
13 suspended fines concentrations may be increased
14 for years following the actual borrow operation,
15 and constitute a more significant potential
16 hazard to the aquatic environment than sources
17 of sediment from induced erosion on watersheds.
18 Such extensive river borrow operations should
19 therefore be avoided."

20 Now, I gather that what you've said this week and last
21 week is our borrow requirements and predictions for the
22 North Slope rivers are not extensive in terms of the
23 available material. Is that fair to say?

24 WITNESS HARLAN: Yes, it is.

25 Q And it's for that reason
26 that you feel this concern does not apply to these
27 rivers?

28 WITNESS McCART: You know, some-
29 where in the previous reference you gave us they're
30 talking about 1.6 kilometers of gravel in extent to be

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1 removed. I don't know where that appears in the
2 application or in the -- it seems to me that first of
3 all, I don't know what they are talking about in terms of
4 river borrow operations. Are they talking about the
5 sorts of things that are proposed in terms of removal
6 from the active flood plain at a time when it is not
7 covered by water in the fall on braided streams?

8 Q Unfortunately --

9 A Are they talking
10 about the removal of gravel from the active channel?

11 Q Unfortunately, Dr. McCart,
12 I can't answer those questions.

13 A Well, I can say this,
14 that certainly if it came to my attention that there
15 was going to be gravel removed from an area in which
16 there was a critical spawning or over-wintering area
17 from the point of view of fish populations, and if it
18 looked as if there would be the chance of initiating
19 bank erosion in an area where it did not then occur,
20 or the migration of gravel deposits in an area which was
21 relatively stable naturally, we would be very much against that
22 and I certainly would want to be assured by someone
23 who was competent in the field that these things had
24 been taken into account and certainly it should be
25 part of any application for gravel removal. An indica-
26 tion that these studies had been done and that there
27 was a very high degree of certainty that these things
28 would not occur. My point is of course that when you're
29 looking at North Slope braided streams that were
30 characterized by a very high degree of instability
that these things are not problems.

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

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2 MR. BAYLY: Q All right then
3 would you as the sort of equivalent of the people who
4 did the studies for E.P.B., Dr. Harlan, agree with that?

5 WITNESS HARLAN: Yes I would.

6 Q And at some point though
7 you are going to have to give Arctic Gas an idea of what
8 is significant in terms of amount of gravel mining in
9 a particular river. Is that correct? As part of your,
10 if you like, your site plan. You should not take more
11 than so many cubic yards from this river because of the
12 change in the dynamics of the bed and bank so that it
13 would--

14 A That, that would be part of
15 it, yes.

16 Q Because even a braided river,
17 despite perhaps what Dr. McCart has said, because it
18 refers to particularly small amounts of gravel compared
19 to the total. If you were to take a tremendous amount
20 of gravel all across, say the Malcolm active stream
21 bed, you might run into this kind of problem. If you
22 were to take all the gravel you needed for the North
23 Slope out of that area, for example. It is not a
24 likelihood but it is something that could happen in a
25 river even like that.

26 A Yes, it would also depend
27 on how you obtained the gravel in terms of what depth
28 of excavation/ ^{were} you are dealing with.

29 Q Yes.

30 A For example, if you took

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Cross-Exam by Bayly

1
2 two inches off the surface, you would probably have
3 very, very little effect.

4 Q Right.

5 A Where if you went to a
6 twenty foot hole then you would have a very pronounced
7 effect.

8 Q Right. And you have the
9 two reasons for not doing those deep burrows. One if
10 because of this problem that I have brought up in
11 river, that you say are not like the North Slope rivers
12 but also Dr. McCart's real concern that you may create
13 ponds that fish could possibly get trapped in.

14 A That is correct, yes.

15 Q Now, without going into the
16 types of things that will be put in water and the types
17 of things that will be used to treat sewage and I am
18 referring to chemicals, assuming that there are chemicals
19 to be used, what sort of plans have you in mind for
20 storing these:(a) So they will be readily available for
21 ongoing use but,(b) and mainly so that they won't be in
22 danger of finding their way into water courses where
23 they might be harmful. Have you made recommendations in
24 that area? Say for example, you were going to use
25 chlorine in your water supply?

26 WITNESS WILLIAMS: We haven't
27 made any specific recommendations, Mr. Bayly, except in
28 general terms, keep them high and dry and under cover.

29 MR. BAYLY: All right. Would
30 you think of using chlorine then in tablet form to make

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

1
2 sure that you had something that had a more difficult
3 time escaping?

4 A In some situations, yes.
5 They can be used, yes.

6 Q All right. And what sort
7 of ways would you bring in chemicals to treat sewage
8 if you were planning on chemical package treatments
9 for certain camps of certain sizes. Would these be
10 brought in in liquid form or in dry form and how would
11 they be stored?

12 A That's a specific study
13 that we haven't done.

14 Q All right. There are other
15 fluids, of course, that are going to be used. Part of
16 your testing depends on a methanol water solution which
17 we have heard, at least in discharge in large streams
18 like the Mackenzie is unlikely to have a significant
19 effect. I am informed that when pipe was tested in
20 Alaska, some of the testing fluid picked up certain
21 things from the pipe itself and I assumed from the
22 coating of the pipe, which made it, if anything, less
23 desirable for disposal in any water course. Have you
24 any information on the kinds of chemical reactions that
25 occurred in tested pipe?

26 MR. MARSHALL: Mr. Bayly, I
27 wonder if you could be a little more specific about
28 these substances and so on.

29 MR. BAYLY: Mr. Commissioner,
30 I am being as specific as I can. I don't have the acts

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

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2 as the applicant may have to ongoing testing of pipe,
3 of other pipeline companies, but I have been informed
4 that this is a problem that was run into.

5 WITNESS WILLIAMS: And your
6 speaking of the Alyeska pipe, are you Mr. Bayly?

7 MR. BAYLY: Yes.

8 A As you know the, while the
9 Alyeska pipe was in storage and stockpiles at
10 various locations in Alaska, it was both internally and
11 externally coated to-- The internal coating/^{anyway}I think
12 was to reduce corrosion while in storage. I am not
13 sure what that particular material was. I think it was
14 a hydrocarbon product. For this gas line, the plan is
15 to internally coat with an epoxy rosin that would
16 considerably reduce the adhesion of contaminants to the
17 interior of the wall of the pipe, either during
18 transportation, or in the testing operation. I think
19 Mr. Scott brought up the point back in the construction
20 program about how much hydraulic fluid might be left in
21 the pipe, in the bending operation by the internal
22 mandrel and I think he suggested a quantity, a very small
23 quantity that I have forgotten, but it is a small
24 quantity. I wouldn't expect that to be a serious
25 problem and, of course, rusting, a very small amount will
26 take place around the ends of the pipe that are not
27 coated because of the weld zone.

28 Q All right. Have you been
29 doing studies to find out whether this epoxy that you
30 planned to use as a retardant of rust or protection

Harlan, Hemstock,
McCart, Williams,
Cross-Exam by Bayly

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2 measure will combine with methanol or methanol in water
3 in any way so as to produce other substances that have
4 been tested on a fish or other aquatic species?

5 A I haven't. I am not sure
6 whether anyone in Arctic Gas has.

7 Q All right. I wonder Mr.
8 Hemstock, you would know of them I imagine?

9 WITNESS HEMSTOCK: I am not
10 aware of any studies that have been done.

11 Q All right. Now,
12 my concern is Mr. Hemstock that perhaps in this case
13 with this question, both of us are dealing with
14 something that may have no effect at all, but neither
15 of us knows. Is it contemplated that with regard to
16 these kinds of possible reactions, tests will be carried
17 out prior to the, you know, the fairly massive use of
18 certain chemicals, certain treatments that will be
19 carried on in the construction and testing of the
20 facility.

21 A I would think that tests
22 would not be necessary. When you specify the kind of
23 internal coating that you would expect to use, the
24 manufacturer, of course, would have the chemical and
25 physical characteristics of that particular rosin and
26 what we would be looking for was one that, of course,
27 is insoluble or nearly so in either water or the proposed
28 testing medium.

29 I would expect that the
30 manufacturer would have all of that in hand once the

Harlan, Hemstock,
McCart, Williams,
Cross-Exam by Bayly

1
2 specification is made.

3 Q All right, Now, we have
4 heard in an earlier portion of the evidence that a
5 1% methanol solution is unlikely to have bad effects
6 on fish or other aquatic life when it is discharged
7 into large bodies of water with large flow. What I am
8 concerned with is that some of this methanol will have
9 to be stored in certain places prior to use. What
10 sort of methods of storage are going to be used to
11 insure that this does not get into water supplies in
12 larger concentrations than 1%?

13 WITNESS WILLIAMS: I think
14 the storage of methanol was dealt with in one of the
15 questions of the pipeline assessment group. I have
16 got the number here somewhere.

17 WITNESS HEMSTOCK: As I
18 recall, we had suggested that the methanol^{would}/be stored,
19 in some cases in the pipeline, for use in the following
20 season and, of course, during the transportation from
21 the supply area to the potential use area, we would have
22 to have large storage just the same as we would for
23 fuel and I would expect that that would be provided
24 with the fire walls in order to prevent any kind of
25 leakage.

26 THE COMMISSIONER: I think
27 Mr. Anthony questioned one of Arctic Gas's construction
28 panels about that at length, in phase one. It was in
29 May, I am sure. If that volume could be found I think
30 it might--

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

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MR. BAYLY: All right. Well,
I will leave that at this point Mr. Commissioner and
if I find that reference, I may refer to that again.
You have no plans though to store this in bladder
tanks along the route? Is that fair to say?

WITNESS WILLIAMS: It is
dealt with in question 12, I think Mr. Bayly, of the--

Hemstock, Harlan, McCart,
Williams
Cross-Exam by Bayly

Q I believe in the responses to question 53, Mr. Williams, it is dealt with. I'm wondering /with regard to it in a very general way and not specifically with the reference to methanol. If you look at 53-2, you talk about transporting methanol over winter roads by tank /^{into} bladder tanks, which will be continually draining during the filling of the test section.

MR. MARSHALL: I am sorry, Mr. Bayly, was that a question, or were you reading that --?

MR. BAYLY: I am trying to help the panel, Mr. Commissioner, to find the reference in the response and it is at 53-2.

WITNESS HEMSTOCK: A Yes, I see the reference and we're now looking at pros and cons of bladder tanks as opposed to steel storage. And the bladder tanks have been used, I guess, for perhaps 12 or 15 years now by industry there for temporary fuel storage. And, the reading I am getting now is that they are giving some problems in the long run and --

MR. BAYLY: Q I understand sometimes people drive over them with heavy machinery and that doesn't -- that causes breakage.

A That's right. Or they get into them with a bulldozer blade. However, that's not necessarily the fault of the tank and a proper --

Q I am not saying it is.

A And a proper protection

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Williams

Cross-Exam by Bayly

1 around the tank to prevent that sort of thing may still
2 make them an adequate means of storage. We're looking
3 at this and we're trying to develop the specifications
4 for storage.
5

6 We realize that steel tanks
7 are favoured by many people and they may well be the
8 way we would go.

9 Q All right. My concern
10 here, Mr. Hemstock, is with methanol for a start,
11 but with other toxic substances too-- petrochemical
12 products that are used for fuel and lubricants, etc.
13 And I am concerned that Arctic Gas will be able to
14 present at some point prior to setting out on any
15 project some sort of rules that they recommend to their
16 contractors for the storage and use of these materials
17 in relation to water courses. For example, if you
18 will look at even the compressor station we were talking
19 about recently, CA-05, it is placed right adjacent
20 to a major river and there is always a possibility that
21 its storage areas are at compressor sites and escape
22 happens for whatever reason you may be faced with an
23 environmental problem that none of us are in a position
24 to cope with.

25 A That's quite
26 correct. The best method of taking care of this, of
27 course, is to use the best care and the best technology
28 right from the start. There is a problem right from the
29 time that it is loaded on to the barges at Hay River for
30 transportation down the Mackenzie River. And the

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

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2 greatest likelihood of spill historically has been in
3 the transfer from one form of tankage to the other.

4 Q Yes.

5 A Certainly we're looking
6 at this and we will be providing a criteria or a
7 criteria to our construction people with regard to
8 storage and recommending types of storage.

9 Q Well, is this something
10 that Arctic Gas will be able to present to this
11 Inquiry so that it can be evaluated? For example,
12 let me suggest to you that you might recommend that
13 all fuel will be stored a thousand feet from active
14 water courses or active lakes and that it be surrounded
15 by gravel berm eight feet in height or whatever and I
16 am just using this by way of an example, so that
17 this can be evaluated by others who may have some
18 experience or something to add to whether/^{this} is sufficient,
19 or whether it is over-cautious, or whatever the problem
20 may be.

21 In other words, it sounds,
22 Mr. Hemstock, as though this will be something that
23 if participants other than Arctic Gas make recommenda-
24 tions on in this Inquiry, it will be without the benefit
25 of Arctic Gas's thoughts on it.

26 A Well, certainly we're
27 looking at those areas now and we're being guided to
28 start with by the regulations which are presently in
29 force and by the D.O.E. guidelines which are in draft
30 form. And those would be the starting points for our

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

1
2 criteria.

3 Q All right. I'm wondering,
4 Mr. Commissioner, if perhaps at some point in the near
5 future Mr. Marshall could indicate to us whether we
6 are likely to receive something in the form of a set
7 of recommended precautions that Arctic Gas would intend
8 to take with regard to toxic substance and their
9 relationship to water courses vis á vis the storage use
10 and transfer?

11 MR. MARSHALL: We just might
12 ask Mr. Hemstock when he expects to have such criteria
13 established.

14 MR. BAYLY: Q Perhaps that
15 would be the best way to solve it. Maybe, Mr. Hemstock,
16 you could tell us whether you do have plans for this
17 information to be made available in the near future?

18 MR. MARSHALL: I mean you might
19 ask him now when he expects to have these, if he does.

20 WITNESS HEMSTOCK: A Well,
21 we would certainly not have the overall material
22 available earlier than a few months from now, but we
23 could provide the specifics with regard to storage and
24 handling of toxics in perhaps a month.

25 Q Now, one of the other
26 areas that was brought up and this was brought up in
27 the cross-examination of Messrs. Weedon and Parker
28 when they were here for the Canadian Arctic Resources
29 Committee, was that Commissioner Parker informed us
30 that as an ongoing program of the Alyeska project the

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Cross-Exam by Bayly

1 builders of the project had to supply to the various
2 governmental agencies lists of the chemicals and
3 substances that they intended to use, which would be
4 either approved or disapproved by the government and
5 in some instances they were providing lists, together
6 with alternates and I am wondering whether it is the
7 intention of Arctic Gas, either at this stage, or at
8 some other stage in their project to provide, not only
9 a list of the substances that they would like to use,
10 but a list of those substances which would be adequate
11 alternates?
12

13 MR. MARSHALL: Provided to whom,
14 Mr. Bayly?

15 MR. BAYLY: I'm asking this
16 as a very open question, Mr. Commissioner, because it
17 may well be that Mr. Hemstock will answer yes, we have
18 that ready in good supply/^{now,} or no, that is a matter for
19 final design and I would prefer to wait for his answer
20 before Mr. Marshall asks me to ask another question.

21 THE COMMISSIONER: Well, that
22 sounds reasonable, doesn't it? Can you help us out, Mr.
23 Hemstock?

24 WITNESS HEMSTOCK: A We have
25 already looked at the list of chemicals which it is
26 fairly obvious will be used by Arctic Gas in the
27 construction and operation but in many cases the
28 details on the final analysis of them will not be
29 available until we get the final design to the final
30 design stage.

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

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2 And particularly, as an
3 example, say lubricants for the turbines. That will
4 depend to some extent on the kind of turbine that is
5 eventually selected.

6 Q And will your selection
7 of something like a turbine if we take that for --
8 a turbine -- if we take that for an example, will it
9 at least in part depend on the environmental assessment
10 of those chemicals, etc. that are required to lubricate,
11 operate and fuel such a facility?

12 A Yes.

13 MR. SCOTT: I wonder if I might
14 interrupt my friend for a moment. This is a -- it seems
15 to us a reasonably important area and Mr. Hemstock is
16 doing some work on it. I wonder if Mr. Marshall could
17 let us know at what stage of the Inquiry, perhaps in
18 the cross-delta stage we could have some evidence on
19 that.

20 We have two or
21 three pages of questions that relate which we're raising
22 now, but obviously they are not going to be able to be
23 answered and I think it would be helpful to Mr. Bayly
24 and myself and the others if we could be given an
25 indication of when it can be dealt with with more
26 particularity in Phase 3, or whether it should be
27 dealt with later on and what time we may expect it.

28 MR. MARSHALL: There has been
29 some evidence pertaining to these subjects. You will
30 recall that the operations and maintenance panel was

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

1 asked to provide a list of substances that was antici-
2 pated would be stored at compressor station sites and
3 I filed the material pertaining to that. So there
4 is some material that has already been put in
5 evidence.

6
7 MR. SCOTT: Well, very little.
8 I don't think the operations and maintenance panel was
9 able to say very much except in a very general way in
10 which they indicated that they anticipated doing
11 everything they could to keep spills and so on to a
12 minimum.

13 That perhaps doesn't go
14 quite as far as we might expect the applicant to go at
15 some stage. Now, it may not be convenient for the
16 applicant to do it now. I'm simply asking Mr. Marshall
17 to let us know when it can be done. It seems to me
18 this is one area in which the public will feel particu-
19 larly that it should have some kind of reasonably
20 detailed disclosure of plans as they develop.

21 MR. MARSHALL: Well, the list
22 a letter
23 that I remember filing is / that Mr. Carlson sent
24 to me ~~that~~ it listed the various substances.

25 MR. SCOTT: Yes.

26 MR. MARSHALL: So that is on the
27 record . You are interested specifically in handling
28 the storage?

29 MR. SCOTT: Yes, and the
30 control of spills and of these materials and contin-
gency plans that may have been developed or in the

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

1 course of being developed to deal with problems that
2 it seems to me respectfully will, notwithstanding the
3 best efforts of everybody, be inevitable in some way.
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Harlan, Hemstock, McCart
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Cross-Exam by Bayly

1 MR. MARSHALL: I'll check this
2 with Mr. Hemstock to see if I can get a reading on
3 where they're at in their work and we'll try to let
4 you know tomorrow, Mr. Scott.

5 MR. SCOTT: Thank you.

6 THE COMMISSIONER: Well, maybe
7 we should adjourn for coffee. Maybe I could just say
8 before we adjourn for coffee that I've been advised
9 that it will not be possible to go ahead with the
10 community hearing at Fort Smith Friday afternoon and
11 Saturday this week, as had been planned. So we will
12 try to go to Fort Smith sometime, I hope, before
13 Christmas; but that remains to be worked out.

14 So, the schedule for the balance
15 of this week, the schedule of formal hearings here in
16 Yellowknife, I'll leave it to you, Mr. Scott, to
17 work that out with counsel but I think we ought to go
18 ahead with the hearing we had intended to have this
19 evening. I thought we'd sit till five this afternoon
20 and come back at eight o'clock and sit for perhaps
21 another hour and a half or thereabouts, and for the
22 balance of the week, Mr. Scott, I'll leave it to you
23 and counsel to work it out, but I think we should do our
24 very best to complete the evidence of this panel and the
25 evidence of the Foothills panel on the physical environ-
26 ment, so that ^{it} would enable us to complete Phase 2 by
27 the end of this week and to begin Phase 3 next Monday.
28 But I'll leave that to counsel.

29 I'm quite prepared to carry on
30

Harlan, Hemstock, McCart
Williams
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1 Saturday, but^{if} you gentlemen can work it out in a way
2 that is more satisfactory to you, that's all right with
3 me.

4 Well, we'll adjourn for a few
5 minutes.

6 (PROCEEDINGS ADJOURNED FOR A FEW MINUTES)

7 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

8 THE COMMISSIONER: Yes, go ahead.

9 MR. BAYLY: Q Gentlemen, on
10 water for camp use, just a couple of --

11 THE COMMISSIONER: Excuse me,
12 Mr. Bayly. We'll take a minute, I didn't realize --
13 take your time, Mr. Marshall.

14 MR. BAYLY: Mr. Commissioner,
15 now that the Steigenberger Report has been made an
16 exhibit, I think Mr. Scott would like to know
17 if it's been assigned a number.

18 (STEIGENBERGER REPORT MARKED EXHIBIT 310)

19 MR. BAYLY: Q With regard to
20 water courses for camp use, and I understand that
21 this maybe a question that the panel will say is a
22 site specific problem, but do you anticipate in any of
23 the sites gathering your water for camp use for an
24 entire construction season at one time and storing it
25 over the intended construction season, releasing it
26 as sewage or waste water, or whatever after it has been
27 used? In other words, will you have the equivalent
28 of a water tower, or a water tank at any of the camps
29 that will keep a certain amount of supply for a period
30 of time?

Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1 WITNESS WILLIAMS: I can't
2 really think of any case, Mr. Bayly, maybe a small
3 camp, 10 or 20-man camp in one spot for a week or
4 two, maybe, but no, not in the larger camps, no.

5 Q Generally speaking then
6 you would either be piping it into your camp or trucking
7 it in, is that the method you would use?

8 A Yes. I think we say at
9 least a one day's consumption in storage.

10 Q All right, and the only
11 exception to this, I gather, would be at compressor
12 stations where you might store water for use for a
13 certain number of man days, is that correct?

14 A This is after construction?

15 Q That is correct.

16 A And during operation,
17 yes.

18 Q You'd be storing enough,
19 I think, in most compressor stations for 8,000 man
20 days at 100 gallons per man? I think those were the
21 figures that were used in the evidence on operations
22 and maintenance.

23 A Yes.

24 Q Have the effects of this,
25 even this quantity of water been assessed where compres-
26 sor stations are located close to only small water
27 courses, or small lakes?

28 A We're now talking about
29 the operation and maintenance requirement?
30

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Williams
Cross-Exam by Bayly

1 Q That's correct. The
2 storage of this quantity of water in tanks over periods
3 of time, I gather, taken when it's most convenient,
4 when the water is free without ice cover and when the
5 levels are high?

6 A Yes, I think somewhere
7 we suggested that the storage at compressor stations
8 their requirement might take place twice a year. The
9 tanks would be filled about twice a year.

10 Q All right, and has this
11 been assessed, Mr. Hemstock, by the environmentalists
12 in the areas where it might pose problems, either by
13 lowering water levels in small lakes, or causing any
14 difficulty in streams drying up before they otherwise
15 would?

16 WITNESS HEMSTOCK: No, it's
17 not been specifically assessed, other than the assessment
18 within the total requirements of a camp, and again
19 it's a small quantity relatively. I would not expect any
20 difficulty in providing that kind of water.

21 Q All right. The effect
22 of it in a sense is to create the equivalent of a small
23 dam or weir, if it's in a water course, is that correct,
24 because you're taking out a quantity of water that
25 would normally go through the water course, and storing
26 it, not in a pond above the dam, but storing it away
27 from its normal course and then re-introducing it as
28 the water is used as waste or surplus water?

29 A Yes, you'd be taking a
30 portion of the flow of a river or of a spring or, whatever,

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Bayly

1 for a very small period of time/^{in order}to provide this required
2 storage.

3 Q O.K., and reducing it
4 gradually throughout the operations and maintenance year
5 as people came to the operations, or compressor station
6 sites and used the facilities for a couple of days a
7 month, or whatever the schedule was?

8 A That's right.

9 Q Now, while we're on the
10 question of compressor stations and I know that we
11 don't have the benefit of Mr. Koskimaki, but these are
12 general questions on air and sound level in the air,
13 Can you tell me, Mr. Hemstock, in quantitative terms
14 the difference in noise levels that would be experienced
15 at compressor stations if they were electrically powered
16 as opposed to powered by the gas that you intend them
17 to be powered by?

18 A Since there is no electric
19 power available, I presume you'd generate the power with
20 a turbine and if you have a turbine to generate electric
21 power, I guess I can't understand the question.

22 Q Let me put it this way.
23 Assuming that you had a source of hydro-electric power,
24 that is power created by damming up water and run to
25 your compressor station by transmission lines in certain
26 areas, can you tell me whether a compressor station
27 powered by this kind of source would create more or
28 less noise than one that is powered by a gas turbine
29 engine with the power produced on-site?

30 A I'm afraid I can't

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1 answer that question

2 Q All right. Are there in
3 any of the panel's experience, and perhaps Mr. Williams
4 would be the person who might have this kind of exper-
5 ience, are there facilities in Canada where compressor
6 stations are powered by hydro as opposed to by the fuel
7 that passes through them?

8 WITNESS WILLIAMS: Yes.

9 Q And are they, generally
10 speaking, do they create higher noise levels than those
11 where the power is generated by the fuel that passes
12 through them, through gas turbine engines?

13 A I would suspect the
14 electrically driven compressors would put out less noise
15 than gas-driven; but I sure don't have any numbers on
16 it.

17 Q You couldn't -

18 MR. MARSHALL: Mr. Bayly, so
19 you're not misled, Mr. Koskimaki had indicated that
20 perhaps the major contributor to noise is not the
21 compressor but the fans required for cooling. I don't
22 know whether or not supplying the motive force to the
23 fans through electricity rather than gas would change
24 that.

25 MR. BAYLY: All right, we just
26 have a general statement then, Mr. Commissioner, from
27 Mr. Williams that he suspects that they would be quieter,
28 one element of noise-making being removed to a differ-
29 ent location, if you will; but we have no figures on
30 it and I'm content with that.

Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1 Q Going onto other aspects
2 of the possibility of electrically powered compressor
3 stations, has any comparative cost estimate been made
4 in terms of the amount of hydro-electric power as
5 opposed to the amount of gas generated power that would
6 be required to operate compressor stations?

7 WITNESS HEMSTOCK: Sorry,
8 your question was?

9 Q We've been told, Mr.
10 Hemstock, in evidence that approximately 7% of the fuel
11 that would go through the Arctic Gas facility will be
12 consumed in transportation, a large part of which will
13 be consumed in the compressing and cooling of the gas
14 at the compressor stations. Now, what I am asking
15 is in terms of cost equivalents, has this been equated
16 to the cost of an equivalent amount of hydro-electric
17 power, should there be a source close at hand that
18 would provide it? Now, before Mr. Marshall says
19 maybe this has nothing to do with anything, one of the
20 reports that is listed as one that Arctic Gas feels is
21 relevant is the Creighton Report on the three hydro-
22 electric dams proposed -- and now I gather shelved --
23 but at one time proposed for the Great Bear River into
24 the calculations at all?

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Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

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5 A This was
6 not in my area of responsibility, but I recall that
7 there was at least a quick look at the feasibility,
8 desirability of supplying one or two stations with
9 hydro-electric power and I cannot recall the details
10 of the conclusion. My recollection is that it was not
11 considered to be a feasible, or likely possibility.

12 Q All right. Now, which
13 stations were these. Do you recall which ones this
14 discussion was held on?

15 A No, I don't, but I would
16 expect that it would be in connection with the
17 possibility of a dam on Bear River and it would be one
18 or two stations adjacent to that along the proposed
19 pipeline.

20 Q Now, I assume that the,
21 when you say discussions, these were discussions that
22 would be held with people who might be responsible for
23 building these kind of facilities in Northern Canada
24 Power Commission or The Department of Indian and
25 Northern Affairs?

26 A No, sir. I was referring
27 to our internal discussions with engineering people and
28 so on, about the possibility of this being of interest.

29 Q Well, did any discussions
30 that you know of, go on with either of the organizations

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

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2 that I have mentioned? NCPC or The Department of
3 Indian and Northern Affairs with regard to the
4 possibility of using Hydro-electric power to run any
5 of the facilities?

6 A Not that I am aware of.

7 Q I gather if there were a
8 great cost differential that the advantages would be that
9 to power facilities by hydro-electric means would
10 involve using a renewable rather than a non-renewable
11 resource to operate your compressor station facilities?

12 A Well there are many other
13 factors that have to be considered. If we stick
14 strictly to environmental matters, I would be greatly
15 concerned about the environmental impact of a dam on
16 the Great Bear River. The other factor that I think is
17 most important is that the throughput of the pipeline
18 is certainly dependent ^{upon} / each compressor station being
19 operative and the carrying of power through a trans-
20 mission line over many miles of northern terrain to a
21 compressor station would cause at least some concern
22 in the availability of that power on a twenty-four hour
23 a day, three hundred and sixty-five day basis for the
24 compressor stations.

25 Certainly we would be concerned
26 about the operability of that kind of a situation. And
27 two compressor stations in sequence on the pipeline,
28 would have an even greater impact.

29 Q Yes, I understand that if
30 one compressor station is out, you can operate without

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McCart, Williams.
Cross-Exam by Bayly

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2 it but if two consecutive ones are out, then you have a
3 stoppage in throughput.

4 A That's right.

5 Q Now, I don't want you to
6 think Mr. Hemstock that I am advocating the use of
7 hydro-electric power either from the Great Bear River
8 source or any other but I want to investigate this as
9 a possibility and while I am investigating it, I wonder
10 if you would give an opinion as to whether you would
11 recommend to Arctic Gas that ^{if} the use of hydro-electric
12 power were made a term and condition of the granting
13 of a right-of-way, whether this would be something that
14 you would recommend doing, that is powering some of
15 your compressor stations through the use of this or
16 whether this problem that you have raised-- Hang on
17 a minute Mr. Marshall. I am not finished. --Whether
18 this problem that you have raised of not being able to
19 guarantee a source of power, would be one that would
20 cause you a great deal of trouble?

21 MR. MARSHALL: I object to
22 the question.

23 MR. BAYLY: Mr. Commissioner it
24 may be customary in some jurisdictions just to object to
25 a question, but perhaps if Mr. Marshall would give us
26 some reasons then we could decide whether it is a
27 relevant question or not.

28 THE COMMISSIONER: Yes, I think
29 that is fair. What are the grounds for objecting?

30 MR. MARSHALL: Well, he had a

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McCart, Williams.
Cross-Exam by Bayly

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2 and
3 very, very lengthy question with many components/built
4 into it. One of which was, if I understood the lengthy
5 question, if it were made a term or condition presumably
6 of the permit, well this may well be a matter over which
7 Arctic Gas would have no control whatsoever, and as
8 to whether the company would, when faced with this
9 specific term or condition, that it must do such a thing,
10 whether the company would decide whether it was to go
11 ahead or not, would be a question policy for the company.

11 THE COMMISSIONER: Well, I
12 think that that point is well taken Mr. Marshall, but
13 leaving aside all these hypothetical matters, isn't Mr.
14 Bayly entitled to just put the thing to Mr. Hemstock
15 on it's merits?

16 MR. MARSHALL: I wish he
17 would sir.

18 MR. BAYLY: Let me rephrase
19 it again Mr. Commissioner so it is perhaps less
20 confusing.

21 Q If we assume that it is
22 desirable to people, other than Arctic Gas, that hydro-
23 electric power be used to power at least part of the
24 facility, or some of the compressor stations, would you
25 be prepared Mr. Hemstock to recommend that the facility
26 use this hydro-electric power in powering at least some
27 of the compressor stations?

28 In other words, Mr. Hemstock,
29 some government agency, like NCPC, may say, "We'd
30 like to put a dam on the such and such river, but there

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McCart, Williams.
Cross-Exam by Bayly

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2 is no sense us putting a dam on it unless Arctic Gas is
3 prepared to use 75% of the power, because otherwise we
4 can't afford the facility and we don't want to build
5 it just to power Fort Franklin and Fort Norman."

6 MR. MARSHALL: Are you
7 interested in Mr. Hemstock's advise as an environmentalist,
8 Mr. Bayly, because obviously in a question of this nature,
9 the cost becomes a factor. I wondered whether you are
10 excluding that from this?

11 THE COMMISSIONER: I think you
12 have to exclude all of those considerations don't you?

13 MR. BAYLY: Yes, Mr. Commissioner
14 the reason I bring it up in this particular phase of the
15 inquiry is that this is a possible impact on water
16 resources in the Mackenzie Valley, that there may be
17 some reason why either the applicant or the governmental
18 agencies, who may or may not wish to give a permit to
19 the applicant, may wish hydro-electric power to be used.

20 THE COMMISSIONER: Well, that
21 is a matter that I dealt with in my preliminary rulings,
22 so far as the Great Bear Hydro project was concerned.
23 No one has suggested, from that time until this, that
24 the project is being seriously considered by the
25 Government of Canada. Mr. Goldie, on behalf of Arctic
26 Gas, made it plain from the outset that Arctic Gas
27 wanted nothing to do with it. The thing is entirely
28 hypothetical at this stage. If you say to Mr. Hemstock,
29 would you rather these things were powered by electricity
30 rather than gas and he says, yes, well maybe you have

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McCart, Williams.
Cross-Exam by Bayly

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2 resurrected the project, although I doubt it.

3 MR. BAYLY: Well, I hope not
4 Mr. Commissioner, but I would like to know the answer
5 to that question. I suspect we have had part of it from
6 the reservations Mr. Hemstock had, but could you answer
7 that question Mr. Hemstock?

8 WITNESS HEMSTOCK: What's the
9 question. / THE COMMISSIONER: Let me ask you a
10 question then, because I am getting lost in all of this.
11 If everything else were equal, would you rather as an
12 environmentalist see the compressor stations powered
13 by electricity rather than natural gas?

14 A If I was asked
15 from the standpoint of the environmental impact on the
16 Territories?

17 THE COMMISSIONER: Yes.

18 A My answer would be
19 no, until I was convinced that the generation of the
20 hydro power did not have a great impact.

21 THE COMMISSIONER: Leave the
22 generation of the hydro power out of it.

23 A If I restrict
24 myself strictly to the operation of the pipeline and if
25 I was convinced that the hydro power would provide a
26 continuous source of power, I think on balance I would
27 probably go along with the generation of power by the
28 electrical methods. But I would point out that it is
29 not particularly simple, because you would require a
30 transmission line and a very large clearing for that

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

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2 transmission line, parallel to the pipeline, to provide
3 this power to the compressor stations. And what you
4 have then is another clearing, parallel to the Mackenzie
5 along with the highway and the winter road and the
6 communications line and the pipeline and, as a matter
7 of fact, for large power transmission lines, you are
8 faced with a much wider clearing than a pipeline or
9 a highway. So, on balance I think it would have to be
10 looked at pretty carefully. It is not a simple answer
11 and you just can't confine yourself to the compressor
12 station itself where there would be some advantage
13 perhaps in lack of emissions and lack of ice, fog and
14 noise. But there are other things which would cause
15 me quite a bit of concern.

16 **THE COMMISSIONER:** Yes. The
17 expanded guidelines for Northern pipelines state that
18 a Mackenzie Valley Transportation corridor might include
19 eventually hydro-electric transmission lines. So, I
20 think, Mr. Bayly, we are indebted to you for reminding
21 us of that and your saying Mr. Hemstock that if you
22 just take the compressor station by itself, you would
23 rather it was run by electricity rather than, instead
24 of natural gas, but that you can't consider it an
25 isolation in that way. You have to consider where your
26 going to get this electricity from. Do you have to build
27 a dam, power house, transmission lines and what is the
28 overall impact of that?

29 A That's right
30 and I would also point out that I am responding only with

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Bayly

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2 regard to environmental matters. I know that there is
3 a great deal of difficulty in applying electric power
4 to this kind of a power usage and that there are other
5 problems from an engineering nature that would have to
6 be considered.
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Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1 MR. BAYLY: Q Well then,
2 Mr. Hemstock, if we go to the next step, the proposal
3 as put forward by Arctic Gas to power its own facility
4 with its own gas --

5 THE COMMISSIONER: Excuse me,
6 I should say that the only people who rejected the whole
7 idea even more vehemently than Arctic Gas were the
8 people at Fort Franklin, you weren't at that community
9 hearing, but the matter was raised again and again, and
10 they indicated they wanted no part of it. So Arctic
11 Gas and the people of Fort Franklin are as one on that
12 particular question.

13 MR. BAYLY: On that, as I
14 say, Mr. Commissioner, I don't mean to suggest that
15 I am a proponent of the scheme, but I want to know
16 what's in the works.

17 MR. GIBBS: I wonder if I
18 might contribute, point out one thing in respect to
19 this, because this is a question that might come to
20 Foothills as well, is that it is possible and has been
21 done on pipelines in Canada to convert to electricity.
22 In fact I'm sure Mr. Williams will confirm this, that
23 TransCanada has done that.

24 THE COMMISSIONER: You mean
25 convert natural gas to use it to generate electrical
26 power?

27 MR. GIBBS: No, convert the
28 compressor to hydro-electric power to save the natural
29 gas that would otherwise burn, and that has been done,
30 I believe, in Northern Ontario. Mr. Williams would know

Harlan, Hemstock, McCart
Williams
Cross-Exam by Bayly

1 about it. Just because you start off with gas power
2 doesn't mean to say that you have to use it all the
3 time.

4 MR. BAYLY: Q Well then, Mr.
5 Hemstock, we do face a possibility then that a gas
6 pipeline which originally is powered by gas may be
7 converted to hydro-electric power, at least in certain
8 locations where that seems to be a cheaper and environ-
9 mentally more sound method of powering the facility.

10 WITNESS HEMSTOCK: A possi-
11 bility.

12 THE COMMISSIONER: Well, if
13 you had a pre-existing hydro-electric transmission
14 system in this valley, if it were already there, the
15 matter is one which would be given serious consideration?

16 A If there was already an
17 existing transmission system?

18 Q Yes, yes.

19 A Yes, I'm sure it would
20 be given serious consideration as^a power generation,

21 MR. BAYLY: Q All right, perhaps
22 we can then, at this point or another, determine from
23 Arctic Gas whether they are planning to use compressor
24 facilities and chilling facilities which can be adapted
25 to the use of hydro-electric power.

26 WITNESS WILLIAMS: I'm not
27 aware of any such study, no.

28 Q Now, at this point would
29 it be fair to say that Arctic Gas has committed itself
30 to not using hydro-electric power at least initially

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Williams
Cross-Exam by Bayly

1 to operate its facility?

2 WITNESS HEMSTOCK:
A I think that's correct,

3 yes.

4 Q And is this basically on
5 the grounds that it isn't available, or is it on the
6 grounds that there has been no satisfactory environ-
7 mental study to show that it wouldn't have more impact
8 to build dams than to build pipelines that are self-
9 powered?

10 A I think perhaps it's
11 based on all of those factors, but certainly it's
12 not available within the time frame that we see requir-
13 ing it,

14 Q Mr. Hemstock, as you are
15 a person I look to as a man with experience in oil
16 pipelines, it is a fact that oil pipelines very often
17 use and sometimes even require hydro-electric power
18 to operate their pumping stations, depending on the
19 quality of the oil that is being transmitted through
20 them, is that correct?

21 A Well, they can use
22 electric power or they can use gas.

23 Q Yes, but they can't
24 always use oil.

25 A That's correct.

26 Q In fact, there are very
27 few instances, like the CANOL line, where oil could be
28 used straight from the pipe in the pumping machinery.

29 WITNESS WILLIAMS: I don't
30 think that's quite correct, Mr. Bayly. The Inter-

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Williams

Cross-Exam by Bayly

1 provincial Pipeline when it was first built did use
2 the oil, the crude oil as it came through the line
3 for burning in their internal combustion engines.

4 Q Yes, I wasn't meaning
5 to suggest, Mr. Williams, that it was the only one, I
6 just said that there are very few where you can count
7 on using the oil directly from the facility. The oil,
8 for example, of Norman Wells was very good in quality
9 and could be used directly in the machinery, is that
10 correct?

11 WITNESS HEMSTOCK: Yes, it was
12 burned in conventional diesel engines. It was exception-
13 ally good, but there are lesser grades that can be
14 burned in other --

15 Q And there are some
16 grades that are almost like tar that can't be burned
17 at all in machinery without being refined. Is that
18 true as well?

19 A There are some crudes
20 that could not be used, yes.

21 Q Yes. To follow this up
22 one step further you have referred, Mr. Hemstock, to
23 discussions, albeit in not very much detail, of the
24 possibility of using hydro-electric power in some areas,
25 if it were available. Are there any areas other than
26 those which are in the vicinity of the Great Bear
27 River that have been discussed ^{with} a possibility of using
28 hydro-electric power as an alternate source?

29 A I'm not aware of any,
30 although it could well have been discussed with regard

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Williams

Cross-Exam by Bayly
Cross-Exam by Scott

1 to the pipeline through the provinces. I'm just not
2 aware of that possibility.

3 Q But as far as the North-
4 west Territories are concerned, it would be just that
5 one area close to the Great Bear River.

6 A I think that's right,
7 yes.

8 MR. BAYLY: Those are all the
9 questions I have, Mr. Commissioner. Thank you.

10
11 CROSS-EXAMINATION BY MR. SCOTT:

12 Q Mr. Hemstock, I wonder
13 if we could duplicate here what we duplicated, or what
14 we tried to do when we were talking about land and just
15 see if I can't get from you and through you and the
16 other members of the panel some general and perhaps
17 obvious principles about environmental concerns related
18 to water and water resources, and I'm talking of course
19 both about lakes and about streams. In the first place
20 I take it that you would agree that because of their
21 special values and relatively high vulnerability, the
22 streams and the valleys that they occupy deserve a
23 particular kind of consideration in all facets of
24 a project of this type.

25 WITNESS HEMSTOCK: Yes, I'd
26 agree with that.

27 Q The second matter is that
28 in a pipeline development, perhaps you would agree that
29 water bodies should not be unnecessarily disturbed and
30 that this principle has application everywhere, not only

Harlan, Hemstock, McCart
Williams
CrossExam by Scott

1 in areas of high sensitivity or visibility.

2 A Yes.

3 Q Now, thirdly, perhaps
4 you could agree that the changes to water bodies and
5 changes affecting water bodies should be avoided or
6 minimized insofar as those changes might have adverse
7 effects on the following listed things: The shores,
8 the banks, or the bed of the water channel, the water
9 flow or level, the physical or chemical quality of the
10 water, the visual aesthetics or the wilderness value,
11 if such there be, areas or resources used by men as
12 a potential use to men, aquatic eco-systems and/or
13 fish, and waters as animal or terrestrial habitat.
14 Do you follow the type of thing I'm trying to get here,
15 a list of the impacts and the check list, if you will,
16 of the importance of avoiding or minimizing those
17 impacts?

18 A Yes, I'd agree with the
19 list.

20 Q And I take it also you
21 would agree that the efforts must be made to avoid or
22 minimize impacts on water courses or lakes and
23 in the valleys in which the water courses occupy because
24 of the possibility, as we have discussed before, of the
25 necessity of re-entry for repair work?

26 MR. MARSHALL:
I'm sorry, I don't under-
27 stand that.

MR. SCOTT:

28 Q Well, surely one of the
29 significant things to have regard to in building a
30 pipeline through the -- through a river, or through a

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 lake or alongside a river -- is to ensure the
2 integrity of the operation, the pipeline operations
3 so that the impacts associated with re-entering to do
4 repair, or repair work on the pipeline, or on the environ-
5 ment will be avoided.

6 A Yes, I would read your
7 question as avoid or minimize impact with regard to
8 the necessity for repairing, that sort of thing?

9 Q Yes.

10 A Yes, I'd agree with that.

11 Q And then again the last
12 principle I put to you, matching one that we dealt
13 with in terrain that where necessary disturbance has
14 taken place and as a guard against future disturbance,
15 the appropriate measures, whatever they may be, to
16 stabilize or rehabilitate, or to restore the water
17 bodies, must be taken.

18 A Yes.

19 Q Well now, I think we've
20 heard, if not from this panel at least from other
21 panels, that river crossings for this project will be
22 designed to meet certain engineering criteria and I
23 take it that the panel agrees that they will also be
24 designed to take account of certain environmental
25 standards. In other words the design of a water crossing
26 is not purely an engineering matter, it has environmen-
27 tal components as well?.

28

29

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Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

A That's correct.

Q Well now, in the assessment group report, or, I am sorry, in your answer to their question 35, you deal with minor stream crossings.

THE COMMISSIONER: That is 35?

MR. SCOTT: Yes, sir, in the orange book. And you defined minor as all streams with active flood plain widths up to a thousand feet and in the second full paragraph on that page, you indicate the type of information that would be obtained as the basis of location and design of these crossings. Do you see it there? It's indented. Now, I think I can avoid the necessity of reading it by simply asking the panel if it is their judgment that that kind of information will have to be collected and collated, or utilized, in order to determine the location and the design of those crossings.

It might be an easier way, members of the panel, if you looked at the Blackwater River crossing which is at 35-5, in which I think is an example of the material that will be available as you determine, or as you move to determine location and design of that river crossing.

Now, what I am really asking is will that be typical for minor river crossings as you have defined them?

WITNESS HARLAN: A I would think that the list that you referred to earlier is typical of the type of information that will be avail-

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Williams

Cross-Exam by Scott

1 able. In addition to this, there will be other informa-
2 tion available, say for example, on the fish resources
3 in the area and also the other environmental concerns.

4 Q Well, looking, for example,
5 at the Blackwater River crossing and I take it that's
6 only an example. That isn't a real crossing -- I
7 see the engineering drawing for example isn't signed
8 or certified by anybody and I presume from that that
9 this is an example.

10 WITNESS WILLIAMS:

11 A It is real to the extent
12 that it was done in the office without benefit of
13 much field study. The contour lines, for instance,
14 were done photogrammetrically and it's not something
15 that you would go to construction with, but it is
16 a typical example of what you would see in a construc-
17 tion drawing.

18 Q But it represents the
19 preliminary design. That, I think, is what it is
20 called, isn't it?

21 A It is for illustrative
22 purposes.

23 Q I'm not sure I understand.
24 Is this ^{the} preliminary design or is this simply a mock-up
25 for illustrative purposes?

26 A It is a preliminary design
27 based on photogrametric interpretation, without benefit
28 of a substantial field study.

29 Q Well, for example, the
30 data on the left-hand side of the page -- that, I take

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1
2 it, is all actual data.

3 A No, in the cross-section
4 profile, for instance, it says "assumed riverbed"
5 something -- I can't -- "elevation." That's not a true
6 profile.

7 Q Well, I take it then when
8 in fact, you come to complete the design for the Black-
9 water River crossing all that information will be
10 obtained and inserted on the drawing? You won't assume
11 anything in the fashion you have in this particular
12 drawing?

13 A That's right.

14 Q The covers, or this kind
15 of material will be available, as I understand it, for
16 all the crossings that you have designed as minor river
17 crossings that you have described or defined in your
18 answer to PAAG.

19 A Yes.

20 Q I see looking at the
21 PAAG answer, means at page 35-1 means 36 crossings? If
22 you look at the third full paragraph on page 35-1.

WITNESS HEMSTOCK:

23 A It means preliminary
24 designs were prepared for 36 copies.

25 Q Have already been prepared.

26 A That is my understanding,
27 yes.

28 Q Well then, how many
29 crossings are we going to have, or is Arctic Gas
30 ultimately going to have this kind of detail for as

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page 35-1 of the response, it states,"This information

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1
2 would ultimately be obtained for all crossings except
3 those in which significant flow scour and lateral
4 migration are not anticipated."

5 I don't have the number
6 of streams at hand.

7 Q Well, I understand from
8 that then that, if you/^{read}that sentence, that this level
9 of detail will be available for all crossings except
10 ones where you make the judgment that one of those
11 three elements is missing?

12 A I think, for all three of
13 these elements that a significant flow of scour and
14 lateral migration are missing.

15 Q All right. So, do I
16 understand then that except where those three factors
17 are present, this level of detail will be available
18 as you move toward final design for each of the river
19 crossings?

20 A Yes.

21 Q How are you going to make
22 the judgment that significant flow, scour and lateral
23 migration are not anticipated so that you can then
24 go on to make the judgment that you don't need this
25 level of design for a river crossing?

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1 WITNESS HARLAN: I would think
2 this would be a river engineering decision, not a
3 hydrologic or environmental decision.

4 Q Well, are you able to
5 give me any help of what the word "significant" in
6 that context means? Let me tell you why quite
7 simply so you'll understand my concern. On the subject
8 of gravel pits, with which I've bored you to the -enth
9 degree on Saturday -- Dr. McCart is nodding -- I
10 came away, if I may say so, satisfied because of the
11 understanding that there would be before a gravel pit
12 was opened a plan, a development plan, which provides
13 a substantial level of detail so that the appropriate
14 authorities, whoever they may be, will have material
15 before them before the gravel pit is open. Now, river
16 crossings have their engineering aspect; they also
17 have their environmental aspect and what I'm trying
18 to get here is to what extent may we have the assurance
19 that that kind of material will be available for
20 river crossings? Now you've told me that except, that
21 it will in cases, except where there is significant
22 -- where significant flow, scour and lateral migration
23 are not anticipated and I want to know if you can
24 help me by telling me what that means so I'll be able
25 to say to myself, "Well, in this kind of situation
26 we can't expect this kind of design drawing be made."

27 WITNESS WILLIAMS: I'm sorry,
28 Mr. Scott, we went through this exercise this summer
29 where I think all the stream crossings south of the
30 60th were done, were surveyed, and I'm not sure, Dr.

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1 Hollingshead headed up this program and a substantial
2 number of streams were surveyed in Alberta this summer.
3 Now, I'm not sure what criteria he used for those, but
4 I think it was primarily based on an aerial photography
5 study. It's pretty hard to say what are significant.
6 Certainly there's some judgment comes into the picture.
7 But we had two or three crews out this summer and they
8 did a substantial surveyed cross-section both across
9 the streams and up and down and parallel to the streams,
10 a large number in Alberta this year.

11 Q First of all, I take it
12 it's an engineering function, as Dr. Harlan has said.

13 WITNESS HARLAN: Mainly, yes.

14 Q Well, who else went with
15 Dr. Hollingshead?

16 A I think it was just the
17 river engineering group.

18 Q I take it that the dec-
19 ision for example that significant flow, scour and
20 lateral migration are not anticipated will be an
21 engineering decision.

22 A Yes, and on a site
23 specific basis.

24 Q Of course, and it will
25 be that decision that will lead to the conclusion that
26 design of the detail exhibited here is not required.

27 WITNESS WILLIAMS: I wouldn't
28 preclude getting some information from Dr. McCart, or
29 anyone of the other environmental people that came
30 along and said, "Look, you should study this stream in

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1 particular, it's not on your list and I think it should
2 be done." I can see that sort of thing happening.

3 Q But you see, the diffi-
4 culty I have is I'm quite prepared to accept that
5 many of these things are final design matters, which is
6 almost a catch-word when questions are asked here
7 it's "final design". I'm prepared to accept that, I
8 understand, I think, the problems after this length of
9 time; but what I want to know is, what final design is
10 going to be done because if we know that, if you were
11 in the happy position of being able to say, all rivers,
12 I would then be content because I would know that at a
13 certain stage input of this level would be available.
14 Now, you haven't been able to say that, you've been
15 forced to say that an engineering decision will be made
16 and where significant flow, scour and lateral migration
17 are not anticipated, well then you won't go this route.
18 All right, is there any way now, or shortly in the
19 future that you can tell me what it is intended to
20 exclude, and how that judgment is to be made?

21 A I would be surprised if
22 you were ready to accept all rivers and I think we would
23 go down to smaller streams than that. Substantial creeks,
24 I think, would be done. I don't think you could do it
25 on that basis, for instance.

26 Q I included creek and
27 river, Mr. Williams.

28 MR. MARSHALL: Could we assist
29 you, Mr. Scott, by checking with Dr. Hollingshead
30 whose area of responsibility this is and letting you

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1 know?

2 MR. SCOTT: All right. I would
3 also be grateful to know to what extent it is anti-
4 cipated that there will be environmental input in the
5 decision to exclude a river from this level of design?
6 I mean, you know, if you were to give Dr. McCart a list
7 of rivers that you -- for which you weren't going to
8 design/^{the}crossings and say, "Is this all right? Tell us
9 if you want any work done on the others." That might
10 be one thing.

11 But if it's simply sort of
12 waiting around for Dr. McCart to say, "Well, gee, you
13 haven't designed that; maybe you should." I am less
14 confident.

15 MR. MARSHALL: Well, on your
16 latter point, perhaps Mr. Hemstock or Dr. McCart could
17 provide you with an answer now. I don't know.

18 WITNESS MCCART: Well, we did,
19 I remember, go through the exercise of looking at all
20 stream crossings in Alberta on alignment sheets and
21 making site specific comments. I think this was
22 prior to Dr. Hollingshead's examination earlier this
23 year. So, we would want to comment on any crossing
24 where there was a water body of significant -- forget
25 that word -- with a population of fish, particularly if
26 we thought there might be some critical effect on
27 the population.

28 MR. SCOTT: Q Well, do I
29 take it from that, then, that Dr. McCart, or comparable
30 environmental advisors will be allowed to comment on

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1 specific designs of every river crossing and be
2 entitled to comment, indeed, be invited to comment with
3 respect to rivers where no special crossing has been
4 designed -- rivers or creeks?

5 WITNESS HEMSTOCK: Yes, they
6 would certainly be expected to comment on those. I
7 would also point out, though, that I would expect that
8 our greatest input and the most help they could be
9 from an environmental standpoint would be to comment
10 on the location before the exact location had been
11 selected, and we certainly have some examples where from
12 an environmental -- where for environmental concerns there
13 our recommendations with regard to river crossings.

14 Q Well, isn't that
15 precisely the opposite of what has been said in answer
16 to the PAAG Report, because in the third paragraph you
17 said:

18 "While precise crossing locations can be
19 selected on smaller channels without the
20 benefit of all the above."

21 My concern is that if you're not going to design each
22 of these river crossings with respect to location and
23 the crossing technique, that there be some assurance
24 given that if one is not designed, or if one is designed
25 with less than complete information, it has the
26 imprimatur of Dr. McCart or some other environmentalist.

27 A I think we're saying the
28 same thing. I'm saying that the important input from
29 the environmental people is with regard to the location
30 in the first place and this is certainly already done

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1 in some detail with the comments on the alignment
2 sheets. Now, there is still some refinement on the
3 locations. Certainly Dr. McCart would comment with
4 regard to his concern on fisheries. I guess I am -- have
5 a ~~prob~~lem in whether his assessment of the design
6 could add materially to the engineering side of it.
7 He would be expressing his concerns and between he and
8 the river engineer, they'd be trying to reach a satis-
9 factory solution to his concern.

10 Q Well, I'm not talking
11 only about Dr. McCart. He's told us clearly that his
12 concern relates to rivers with fish populations.
13 I'm talking really about the environmental staff, and
14 I want to be certain that if crossings are not designed
15 with this level of detail, that meets with the approval
16 of the environmental staff.

17 A I think that the environ-
18 mental staff input has to be before the design stage.
19 Now, I guess I can see in certain cases where there
20 should be input from, say, a person concerned with
21 mammals, with regard to habitat in the river and
22 he would have an input in that particular case, yes.
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1 Q In the Blackwater River
2 crossing there's a note somewhere, I forget, that
3 you'll need further information for the design such as
4 soil sampling and testing on the left bank. That's
5 fine. I take it that you will also need other informa-
6 tion of an environmental type to assure yourself that
7 not only the location of the crossing but its design
8 meets environmental concerns and I'm thinking, for
9 example, of such things as the lowest winter water flow
10 might be significant at one crossing or another and
11 things of that type.

12 WITNESS WILLIAMS: Well maybe
13 if we went through the process that will be carried out
14 it might be of help, Mr. Scott. First of all, as Mr.
15 Hemstock suggested, the final location of many of these
16 crossings is not yet complete. There will be some
17 minor changes and that will be done with river engineers,
18 construction engineers, and the environment, the various
19 branches of the environmental group.

20 Then after that agreement has
21 been reached there will be a survey, a cut-line survey
22 where additional information will be obtained. Then
23 there will be no doubt environmental people with that
24 group. That will then be followed by clearing ahead of
25 construction and I'm sure there will be environmental
26 people involved with that group.

27 Surely after all these processes
28 that these streams are going to be looked at and the
29 problems defined.

30 Q Well, I'm sure it may be.

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Williams
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1 What concerns me is that to know whether at a stage
2 before the final design is selected there will be
3 environmental information obtained about these rivers
4 in some written form, such as an addenda to this informa-
5 tion that you have with respect to the Blackwater River
6 crossing.

7 WITNESS McCART: Of course we
8 have, from the fisheries point of view, prepared catalogues
9 of all of the lakes and streams that we've examined,
10 or other people have examined along the route of the
11 pipeline and we have hundreds of pages of this kind of
12 information. These have been put in loose-leaf form
13 so that we can add new information as it comes in.
14 ~~Yes~~, and we have the Blackwater River, of course.

15 Q Well, this drawing pur-
16 ports to show the information that is necessary for the
17 design and what I'm anxious to get, if it can be so,
18 is an answer which will tell me whether environmental
19 information -- and I can go through a list of the kind
20 of things -- will be made available for these purposes
21 as well and I'm thinking, for example, as I've said,
22 of the lowest winter water flow and its variation,
23 if you have it over a year or two, the size of the zone
24 of high permeability unfrozen material beneath the river,
25 information, if there be any, on the variation of
26 turbidity in the river, and that sort of thing. The
27 kind of information that I understood you to say the
28 other day would be available when you came to open your
29 gravel pits, because it's one thing, and I'm sure an
30 excellent job will be done; it's one thing to have Dr.

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1 McCart go out and say to the chief engineer, "Well,
2 that's O.K." and that will give us some assurance, it
3 will give us assurance of a different dimension if he
4 says, "That's O.K. on the basis of information that
5 has been attained or provided with respect to a
6 particular river in each case."

7 WITNESS WILLIAMS: Well, I have
8 a couple of problems, Mr. Scott. It seems to me that
9 it would be to Arctic Gas' benefit to have this work
10 done to the extent possible, because there's no way
11 that you want to get there with a construction crew and
12 as I understand, it has happened on Alyeska, and say,
13 "Whoa, we have to look at this a little closer." That
14 certainly wants to be something that you would want
15 to avoid.

16 But the problem does come down
17 to the size that you mentioned earlier. There is some
18 judgment required there and whether or not you have
19 a detailed drawing for every minor stream is, in my
20 opinion, a judgment factor.

21 Q Well, I'd like to know
22 at some time, not necessarily today, what your judgment
23 is. I take it first of all that the Territorial Waters
24 Board, if it exists, will have to pass on crossing
25 plans, assuming that the regulatory agencies, that now
26 exist are in charge?

27 MR. MARSHALL: I assume that's
28 a question of law.

29 THE COMMISSIONER: Well, it is,
30 I think we can all assume that, though.

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MR. SCOTT: All right.

THE COMMISSIONER: Just go
on from there.

MR. SCOTT: Well then, I take
it, Mr. Williams, that information will have to be
provided to them of the type I'm describing.

A The only regulations that
I am aware of with respect to stream crossings under
the National Energy Board Act, Mr. Scott, is the
requirement to meet the requirements of the Navigable
Waters Protection Act and that certainly does not
include many small streams. So Arctic Gas, I'm sure
has and will go far beyond that requirement.

Q Well, maybe you haven't
run into the Territorial Water Board, under the
Territorial Waters Act yet, but that will no doubt be
ahead of you; but what I am really trying to ask you to
say, if you can, is a different level of confidence
would be achieved if it was thought that there was in
effect by information a kind of environmental impact
statement, whether you like the phrase or not, that
is, environmental information with respect to river
and stream crossings at each location. Now I understand
your reservation that we shouldn't be asked to do it
at every little creek. I just wonder if you can tell us
(a) whether that's going to be available, and
(b) the cases in which it probably will not be
available. Is there some cut-off point that you can
direct us to?

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WITNESS HEMSTOCK: Mr. Scott,

I don't see any difficulty in providing like a mini-environmental impact assessment of the streams and waterways where there are fish present downstream of that location and I would guess at any time of the year that might be one cut-off, one definition that we could use. Certainly we would be assessing these from the environmental standpoint primarily from the fisheries point of view. The concerns with regard to birds and mammals are much more site specific and they would be normally a part of the assessment of the route itself, that is the pipeline alignment.

WITNESS MCCART: I would just add that maybe you could look at the birds and mammal concerns as being much less site specific, because for many of these streams that would be crossed, probably 50 or 60 of them we could provide an assessment of the potential impact on fish populations right now using our information we have available both in the stream catalogues that we've prepared and other information that's available from other sources.

Q Well, my information is, and perhaps this will help you, is that the Mackenzie Highway is expected to provide a site specific design, and I gather it has to have not only engineering information but environmental information for all creeks that it crosses greater than one square mile in drainage area. Now, I don't know whether that is a practical cut-off point, or whether it's not, but I would like your assessment whether that's practical,

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1 and if it is whether you're going to be doing that.

2 A Roads are very much more
3 damaging to fish populations than are gas pipelines,
4 and I think you might have to take that into consideration.

5 Q Well, one goes over, the
6 other goes under.

7 A I'd say if you take one
8 square -- what was it, kilometer^{or} mile?

9 Q I think it was mile.

10 A It may have no meaning
11 from the point of view of fish populations at all,
12 because if you're dealing with a spring stream which,
13 you know, has essentially no --

14 Q I'm sorry, Dr. McCart,
15 I didn't want us to isolate simply fresh fish populations
16 because as you have said, there may be rivers which have
17 no fish populations and then you won't be concerned
18 about what happens at that river unless it flows into
19 a river that does. What I'm concerned about is the
20 environmental information that relates to the crossing
21 and that is an input into crossing design, whether it
22 be from a mammologist, or a bird man, or in an appropriate
23 case, a fish man. I'm simply putting to the panel that
24 this is a requirement of the Mackenzie Highway, and I
25 wonder if it's a satisfactory one for you, and if not,
26 why not?
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2 MR. MARSHALL: I think it is
3 proper for Dr. McCart to answer it with respect to his
4 discipline. That is one of the components you seem to
5 be interested in.

6 MR. SCOTT: Surely, Mr.
7 Commissioner, I think I understand Dr. McCart well
8 enough now, to hear him say, well if it is a hundred
9 square mile area and there is no fish in the river and
10 they don't over-winter there and they don't spawn there,
11 "As a fish biologist, I am not concerned about that
12 river unduly." Isn't that your position Dr. McCart?

13 WITNESS McCART: Yes.

14 MR. SCOTT: All right.

15 WITNESS McCART: One square
16 mile doesn't mean very much to me or any other figure
17 that you may pick out.

18 MR. SCOTT: Well, I am trying
19 to see if I can get some assurance as to where your
20 going to stop and I suggested one standard that has been
21 utilized. If you don't like that standard, could I
22 have another one?

23 WITNESS HARLAN: I will
24 comment on this standard. It is kind of a meaningless
25 criteria, in that if you are dealing with a flat area,
26 what the run-off characteristics from a one square mile
27 basin would be completely different than an area of say
28 steep topography.

29 MR. SCOTT: It may be mean-
30 ingless and I don't put it forward to be either justified

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2 or attacked, but at least it is a standard that will
3 give the public assurance that certain things are being
4 done on rivers of certain definition, even if the
5 definitions appear to be meaningless and be meaningless
6 to some expert. Now, you told us about gravel pits and
7 I am elated to know what your going to do there. What
8 I want to know is what are you going to do for rivers
9 and creeks? If it's impossible to tell me today, some
10 other day will do.

11 MR. MARSHALL: It might be
12 helpful if you could clarify a little bit. Is this
13 a specific regulation under certain legislation that
14 has imposed this one square mile?

15 MR. SCOTT: No, it is not.

16 MR. MARSHALL: Well, could you
17 be a little more helpful for the panel so they know
18 what it is they are being asked to comment upon as far
19 as its suitability.

20 MR. SCOTT: This is what is
21 required by the department, I gather, with respect to
22 river crossings on the route of the highway.

23 MR. MARSHALL: Which department?

24 MR. SCOTT: Indian and Northern
25 Affairs.

26 MR. MARSHALL: Thank you.

27 MR. SCOTT: Now, I don't ask
28 the panel to justify it or critisize it. I simply say
29 that that is a standard. I would like to have from
30 Arctic Gas some standard. Above this we will provide

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2 engineering and environmental data. Below this either
3 we won't, or we'll have to look at them individually, or
4 something.

5 WITNESS HEMSTOCK: Yes, we
6 can do that.

7 MR. SCOTT: Oh, Dr. McCart,
8 having listened to your answers to Mr. Bayly about the
9 Firth and water extraction from it, I am not quite
10 certain what your present recommendation is. Do I under-
11 stand that your recommendation to Arctic Gas, is that
12 water should not be removed from the Firth?

13 WITNESS MCCART: Well we are
14 concerned about two spring water sources on the Firth.
15 One of them is one we call spring two, which is between
16 the Malcolm and the Firth. That one has a very large
17 population of Arctic char, we would recommend that that
18 be left entirely alone. The other spring source is on
19 the fan of the Firth towards its western extremity.
20 There is a small population of Arctic char in the area,
21 mostly juveniles as far as we can make out. We feel
22 that particular area, we can probably withdraw water
23 using specialized techniques and taking appropriate
24 measures without damaging fish populations.

25 MR. SCOTT: How about at the
26 crossing?

27 A Well, we would be concerned
28 about the crossing, of course. I think that our data
29 certainly show that the crossing is frozen to the sub-
30 strait. We don't know whether there is sub-surface

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2 drainage there or not. It is possible to withdraw
3 water from these areas using wells, if there is
4 sub-surface drainage within a reasonable depth that we
5 would be very concerned. However, it would have to be
6 demonstrated to us that by withdrawing water from a
7 well at the crossing or at the vicinity of the crossing,
8 you would not dry up the flow from the spring, in the
9 Firth itself.

10 Q How about taking
11 water out of the crossing just before or before it is
12 frozen?

13 A I don't think we would have
14 any particular objection to that. If it were taken
15 above the sub-strait, late in the season, after the
16 Arctic char populations had passed beyond that point.

17 Q Well do I understand then,
18 just in summary, that the second ^{spring that} you referred to, where
19 there are some juvenile Arctic char, your feeling at
20 the moment ^{that} is/you want to do more studies with respect
21 to that?

22 A Yes, these are preliminary
23 studies we are doing, of course. We would have to have
24 a final design, it seems to me. Now, by preference, we
25 would prefer it to draw the water as far downstream
26 of the orifice as possible, even if it means putting
27 a well into the sub-strait beyond the point where one
28 has any water flowing at the surface to insure that the
29 fish weren't going to be damaged. In other words, only
30 in very special circumstances would we like to see people

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2 remove water at the orifice rather than further on
3 downstream. We know that in general the fish popu-
4 lations in these areas stay in the open portion of the
5 stream or just under the upstream edge of the ice in
6 the aufeis area. And by removing water from the tail
7 of the aufeis, or within the aufeis area from the wells,
8 we don't feel we are doing any particular damage.

9 Q Well, in summary
10 do I understand you to say that you would recommend to
11 Arctic Gas that they could take water before freezing
12 at the crossing?

13 A On that particular stream.
14 Yes.

15 Q On the Firth?

16 A Yes.

17 Q You are not prepared to
18 either recommend, or recommend one way or the other,
19 with respect to the spring that is further down where
20 the juvenile char are located? You want to do more
21 work on that?

22 A We would want to come up
23 with a detailed mapping of the distribution of Arctic
24 char at different times of the year in that particular
25 spring. Now, we have done this for this fall. We have
26 some idea of where they are at this time of year. We
27 plan on going back in the late winter in March of 1976
28 to find out where they are at that time of the year.
29 We get further information on flows late in the winter
30 period.



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2 MR. SCOTT: And do I under-
3 stand then that, subject to those two things, you would
4 not recommend that water be taken from the Firth?

5 A I am saying that I think
6 that in that particular spring, yes. Water can be
7 removed in all likelihood subject to certain rather
8 stringent, mitigative measures. In other words, we
9 wouldn't want a roadway to go down the middle of the
10 spring during the course of the winter. We would want
11 the area from the orifice downstream for a considerable
12 distance to be off limits. We feel however, that we
13 could go around the spring coming up from the bottom,
14 and take water from an area downstream of where the
15 fish are distributed and if we do this I can't see how
16 we can harm the fish population, as long as we are
17 taking the water from a point downstream of where the
18 fish are located.

19 MR. SCOTT: Apart from the
20 crossings, are those the only places, as far as you
21 know, that Arctic Gas proposes to take water out of the
22 Firth?

23 A Actually, at the moment, I
24 don't think Arctic Gas has made any written proposal
25 to actually take it out of the Firth. This is something
26 that we are investigating. We are trying to find out
27 where these springs are, how the fish populations are
28 distributed and whether it is possible in some instances
29 to take water from springs which do support fish
30 populations without harming them.

Harlan, Hemstock,
McCart, Williams,
Cross-Exam by Scott

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MR. SCOTT: Well perhaps Mr. Williams can help us. I understood and I can't put my finger on it at the moment, that one of the responses to the assessment group indicated affirmatively and I know there may be changes, but indicated affirmatively that water may be taken from the Firth.

WITNESS WILLIAMS: That is probably in that question 52.

MR. SCOTT: I think it is, yes. 52-2.

WITNESS MCCART: What I meant was from that **specific** spring. It is shown on that map as a river water source.

WITNESS WILLIAMS: This response, of course, Mr. Scott was made about a year and a half ago, based on data that Dr. McCart had at that time and he has done a fair bit more since then and in fact has identified alternative sources, over and above what is shown in response to this question, potential sources. We are quite comforted in what he has found lately compared to what we knew when this response was written.

MR. MARSHALL: I think Mr. Scott, in the response 52, they make certain assumptions that the environmental studies that will be conducted later will have the same results as the preliminary ones. In other words, they are saying that there don't appear to be any over-wintering fish in these rivers, downstream of the pipeline right-of-way and then they go on to say,

Harlan, Hemstock,
McCart, Williams.
Cross- Exam by Scott

1
2 "Assuming this proves to be so, it will be environmentally
3 acceptable to remove water from these rivers". They
4 don't anywhere say that they intend to take water from
5 the Firth.
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Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

There

is no mention of springs anywhere in this response that indicated water source on the Firth as I understand it refers to this possibility of taking water from the Firth just prior to freeze-up late in the year.

Q And, I take it, Dr. McCart, that even if you weren't looking at the springs that you were looking at would you have any objection to that proposal?

A Which proposal is this?

Q The proposal that is contained in 52-2.

"It will be environmentally acceptable to remove water from the Firth prior to complete freeze-up."

A Yes, presuming as it goes on to say, that there are no over-wintering fish in these rivers downstream^{of} the pipeline right-of-way.

Q And when do we anticipate that you will have that information as to whether there are over-wintering fish?

A I think we have it right now.

Q And the answer is that there are over-wintering fish.

A The answer is that there are over-wintering fish associated with a spring in the western portion of the fan of the Firth River.

Q All right. Well, then

Cross-Exam by Scott

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Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

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2 THE COMMISSIONER: Well, it is
3 almost five and I think we should. We'll come back at
4 8:00 tonight and sit for about an hour and a half if
5 that is all right.

6 (PROCEEDINGS ADJOURNED TO 8:00 PM)
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Vol. 85

AUTHOR

Mackenzie Valley pipeline inquiry:

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Government
Publications

MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF APPLICATIONS BY EACH OF
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS
CROWN LANDS WITHIN THE YUKON TERRITORY AND
THE NORTHWEST TERRITORIES, and
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY
THAT MIGHT BE GRANTED ACROSS CROWN LANDS
WITHIN THE NORTHWEST TERRITORIES,
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

November 12, 1975.

PROCEEDINGS AT INQUIRY

Volume 85 -- A

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CANADIAN ARCTIC
GAS STUDY LTD.

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LIESA 1



APPEARANCES:

Mr. Ian G. Scott, Q.C.,
Mr. Stephen T. Goudge,
Mr. Alick Ryder and
Mr. Ian Roland for Mackenzie Valley Pipeline
Inquiry;

Mr. Pierre Genest, Q.C.,
Mr. Jack Marshall, and
Mr. Darryl Carter for Canadian Arctic Gas
Pipeline Limited;

Mr. Reginald Gibbs, Q.C. &
Mr. Alan Hollingworth for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &
Prof. Alastair Lucas for Canadian Arctic Resources
Committee;

Mr. Glen W. Bell and
Mr. Gerry Sutton for Northwest Territories
Indian Brotherhood, and
Metis Association of the
Northwest Territories;

Mr. John Bayly or
Miss Leslie Lane for Inuit Tapirisat of Canada,
and The Committee for
Original Peoples Entitle-
ment;

Mr. Ron Veale and
Mr. Allen Lueck for The Council for the Yukon
Indians;

Mr. Carson H. Templeton, for Environment Protection
Board;

Mr. David Reesor for Northwest Territories
Association of Municipal-
ities;

Mr. Murray Sigler for Northwest Territories
Chamber of Commerce.

CANADIAN ARCTIC
GAS STUDY LTD.

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I N D E XPage

WITNESSES FOR CANADIAN ARCTIC GAS PIPELINE LIMITED:

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R.A. HEMSTOCK,

Peter J. McCART,

Guy Leslie WILLIAMS

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- Cross-Examination by Mr. Scott 12708

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Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. SCOTT: Could I announce the result of my meeting with counsel and with the court reporters in respect of our time-table? The difficulties have been created by the fact that it's very difficult to put in an extra day when the community hearing is unfortunately cancelled and personnel problems have made it particularly difficult this time around. What we propose is that we should sit this evening, of course, and I anticipate that subject to re-examination, if any, we'll be able to finish this panel or come very close, we'll sit tomorrow morning and afternoon; and with the gracious permission of the court reporters we may sit or we will sit in the evening, during which time Mr. Williams will be cross-examined on construction scheduling in the dark of night.

THE COMMISSIONER: I thought it was in the dark of the daytime.

MR. SCOTT: It's only the night-time dark, I gather, that causes concern.

Then we will sit on Friday from 9 until 1, and next week we would like to revert to our normal hours, that is from 9 to 1 and several hours in the afternoon and see how we get along.

THE COMMISSIONER: Well, next Monday --

MR. SCOTT: Yes sir.

THE COMMISSIONER: -- when do you want to start?

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 MR. SCOTT: Well, it doesn't
2 matter to me.

3 THE COMMISSIONER: Well, some
4 people are going back south Friday afternoon.

5 MR. SCOTT: Mr. Gibbs will have
6 to -- and Mr. Marshall will have to come back, so it
7 may be that one o'clock is the easiest.

8 THE COMMISSIONER: Yes, well
9 that's all right with me. I really would like if we
10 can do it -- if we can't, we can't -- but if we can
11 do it I'd like to get through the Foothills panel this
12 week. We're not even through this one, but I would
13 still like to try.

14 MR. MARSHALL: Mr. Williams,
15 would, I'm sure, appreciate if it would be possible
16 for Mr. Gibbs to cross-examine him with respect to
17 rebuttal evidence early enough that he might catch the
18 evening plane rather than stay over; if that proves to
19 be possible I'm sure Mr. Gibbs will accommodate him.

20 MR. GIBBS: We have gone over
21 this and discussed this and I pointed out to Mr. Mar-
22 shall several times that I can't be ready to cross-
23 examine Mr. Williams on his rebuttal evidence about
24 construction in the dark until tomorrow evening.

25 THE COMMISSIONER: Well, I
26 think that means Mr. Williams won't get away till
27 Friday. I have that feeling about it all.

28 MR. MARSHALL: I think he
29 does too, sir.
30

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 THE COMMISSIONER: Well all right,
2 Mr. Scott, you carry on then.

3 MR. SCOTT: Q Dr. McCart, most
4 of the discussion we've had about potential effects
5 of water removal is concentrated on the Yukon coast.
6 In the Assessment Group Report at page 312. Do you
7 have that in front of you? The Assessment Group
8 identifies four rivers in the Mackenzie Valley, as
9 examples of streams where "extraction of any substan-
10 tial quantity of water from areas of critically low
11 discharge could adversely affect over-wintering fish
12 populations." These appear from the Assessment Group's
13 Report to be highlighted as examples, and I don't
14 gather that there is anything exhaustive about their
15 list. I note in passing that each of the rivers is,
16 I think, adjacent to a proposed compressor station and
17 I wonder if you could comment on these four rivers or
18 any of them in terms of potential effects of water
19 extraction for camp use, or for snow roads, or for
20 pipe testing?

21 WITNESS MCCART: We're
22 carrying out a study on Vermilion Creek. We've had a
23 man there all summer and he just got back last week,
24 so I suspect we're probably going to have something
25 like 4 1/2 months continuous observation on that
26 stream and I suspect that we'll be able to make
27 fairly detailed comments on the possibility of removing
28 water from that particular stream. It has a major
29 tributary, not a creek, which we've also been looking
30 at.

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 Q That work is under way,
2 in other words?

3 A That work is under way,
4 yes.

5 Q All right.

6 A Oscar Creek has always
7 been a bit of a mystery to me. I have not yet seen
8 a really detailed report on what's happening there.
9 What I thought was an impassible falls oh, approximately
10 five or six miles upstream of the mouth of the creek,
11 I should point out that about one, four or five miles
12 south of Oscar Creek in the vicinity of the pipeline
13 area is a major spring. There are two series of lakes
14 one of which drains into Oscar Creek, one of which lies
15 immediately to the south and drains independently.
16 The one that lies to the south and drains independently
17 is fed by a major groundwater source in that area,
18 and we have not yet found fish in that groundwater
19 source.

20 So, here is an alternative.
21 Separate from the Oscar Creek drainage which could be
22 utilized, if necessary. It's not that far away and I
23 think quite accessible.

24 Q So that's sort of a
25 Firth River situation in one sense, that the discovery
26 of the groundwater source means that unless it is
27 connected in some way with a river, you can take the
28 water from the groundwater source and not run any
29 risks in relation to the river; is that it?
30

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 A Yes, the other thing is,
2 of course, both the Vermilion Creek and the Oscar
3 Creek crossings are within, I would say, four or five
4 miles of the Mackenzie River, so that is the obvious
5 alternative in both cases. If you do run into some
6 difficulty in taking water from these minor drainages.

7 The River Between Two
8 Mountains -- There is a fair amount of groundwater
9 in that area. I don't see it as being any kind of a
10 critical area in the vicinity of the pipeline crossing.
11 I'm not just certain, but I think there is also a major
12 spring where there are springs on the River Between Two
13 Mountains, but I detect there is one quite close to the
14 pipeline routing that drains into a small stream
15 there -- Sorry, into a small pond, a groundwater
16 source again.

17 Again, also very close to
18 the Mackenzie River which is the obvious alternative as
19 far as water supply goes.

20 Rat River -- We passed
21 through the very lower end of the Rat River. Also
22 relatively close to other major drainages, I think
23 the Peel River there might be an alternative.

24 And there is the Malcolm,
25 Firth River and Fish Creek mentioned, which we have
26 discussed at length.

27 In each of the other four
28 cases, the Mackenzie River or other major drainages
29 very close at hand and could easily be utilized.
30

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 Q Well, what rather concerns
2 me is while the Mackenzie is close and is a suitable
3 alternative, there will be no pressures to use the
4 Mackenzie unless you say so and/I really want to know
5 is are you in the course of preparing a report as to
6 whether these rivers, or the springs adjacent to them
7 can be used, or what is the situation?
8

9 A Well, we haven't specifi-
10 cally commented on these places. I hadn't thought that
11 for instance we would be in the process of withdrawing
12 water from the River Between Two Mountains. It hadn't
13 struck me, but because of the proximity of the
14 Mackenzie River in each case, these are not areas that
15 we're very much concerned about. Now, we know some-
16 thing about -- we have comments -- We have information
17 on each of these rivers. As I say, we have a great deal
18 of information on Vermilion Creek. The fishery
19 service ^{has} /carried out, I think, two years of studies
20 on Oscar Creek and in one year put a weir in there so
21 there is a great deal of information there.

22 The Rat River has been
23 studied in great detail.

24 Q I understand it has been
25 studied. The reason why each of these creeks has been
26 high-lighted is because very close to it is a construc-
27 tion pad and a compressor site.

28 A Yes.

29 Q And if human nature
30 continues to be what has always been, the persons at

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 that site will go for water to the nearest source, which
2 in each of the cases is those rivers and not the
3 Mackenzie. Now, it may be that the Mackenzie is a
4 perfectly suitable alternative but until someone -- an
5 environmentalist comes along and says water may or
6 may not be taken out of those rivers. I presume in the
7 absence of such a statement the applicant will take
8 water out of those rivers. And before it does, I think
9 it would be useful to know what you think of that
10 course of conduct.

11 A Okay, Vermilion Creek --
12 I think you can, in fact, take water out of that
13 stream because we have studied this particular stream
14 for several years. We provided Dr. Van Everdingen
15 with samples from, I think, five or six springs along
16 the course of Vermilion Creek. We have discharges
17 from them. We have a pretty good idea^{of} where the
18 grayling are distributed. They are distributed upstream
19 in large part of the crossings so I think, yes, if we
20 had to take it from Vermilion Creek, it can be done
21 without detriment to over-wintering grayling population.

22 Oscar Creek, I'm a bit
23 unclear on exactly what has gone there, but I would say
24 that we might, in that instance want to go somewhere
25 else other than Oscar Creek itself.

26 River Between Two
27 Mountains -- We know that it has winter flow. No one
28 has demonstrated that there are any critical areas for
29 over-wintering fish in the vicinity of the crossing.
30 There are springs on the River Between Two Mountains.

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 I think that probably it can be taken out of there
2 also without detriment to fish population.

3 Rat River -- We'll be
4 withdrawing water considerably downstream of the
5 over-wintering areas for any fish, for any Arctic char
6 on that river and I don't think that withdrawing water
7 from the Rat River is going to harm Arctic char
8 populations.

9 Q Well, now, I don't want
10 to touch on something that has -- will be dealt with
11 in Panel Three but throughout your evidence, you have
12 indicated I think relatively clearly that your approach
13 to the problem as a fish biologist is to isolate those
14 streams or rivers which have a significant fish
15 population and then either out of your bag of knowledge
16 or by on the ground work to do a kind of environmental
17 assessment as to whether the water removal will endanger
18 that significant fish population.

19 Now, on the alignment
20 sheets, there are listed notes about various rivers
21 and I take it those notes were made by you or
22 people under your direction.

23 A Yes.

24 Q Well now, in the context
25 of the Mackenzie Valley, what do you mean when you say
26 "significant fish population"?

27 A Well, I don't like to
28 phrase it that way. A critical area, an area that
29 we are concerned about is an area where a major
30 proportion of a fish population might be affected,

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 as I said before. Now, in the Mackenzie Valley our
2 major concern is with grayling populations and we are
3 particularly concerned -- I'm speaking now about this
4 multitude of streams that are across. These are
5 basicallt streams that support grayling populations.

6 We want to be assured
7 that we're not going to degrade spawning areas. Now, I
8 think it is fairly certain that most of the fish that
9 spawn in tributaries of the Mackenzie River are actually
10 absent from those streams during the course of the
11 winter.

12 We have data from the
13 Donnelly River, the fishery service has data from Three
14 Day Lake. In both instances, it appears that the fish
15 that enter and spawn in these streams are actually fish
16 which have over-wintered elsewhere. It looks as if the
17 bulk of them probably over-winter in the Great Bear
18 River or in Great Bear Lake at a hundred miles or more
19 removed from the area in which they spawn.

20 Q Well, when you say to me
21 Doctor, that you first try and isolate rivers which have
22 a significant fish population, now I understand you to
23 mean by that, by fish population, rivers in which
24 spawning or over-wintering goes on and is thereby
25 judged by you to be an important river for fish.

26 A Yes.

27 Q Now, recognizing that
28 we're talking basically about over-wintering and
29 spawning, how do you choose those rivers?
30

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1
2
3 For example, I
4 know a river off the Hare Indian River which is full
5 of jack fish, I know to my personal experience. Now,
6 I presume it is one of the great jack fish resources
7 of the valley.

8 THE COMMISSIONER: Jack fish
9 were pretty small on that occasion,
10 weren't they?

11 MR. SCOTT: They were juveniles
12 Mr. Commissioner but--

13 MR. MARSHALL: Under legal
14 size.

15 MR. SCOTT: But it occurred to
16 me as I heard you say, talking about this matter, would
17 Dr. McCart consider that a significant fish population?

18 WITNESS MCCART: Well, I
19 might. I don't know which stream you are referring to
20 but certainly we are concerned about jack fish also, I
21 might add.

22 MR. SCOTT: Well, that's what
23 I am getting at. I take it that in deciding whether
24 a river is a significant fish river, you don't exclude
25 any kind of species from--

26 A No, we even consider slimy
27 sculpins and things of that nature.

28 Q I beg your pardon.

29 A I say we even consider slimy
30 sculpins in our deliberations.

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

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Q So, what makes a significant
fish river is not the species primarily that is there.

A No.

Q It is the importance of the
river to a species or several species of fish?

A Yes.

Q Now, are you concerned
about volumes?

A The volume of discharge of
the river?

Q No, the volume of fish that
is found there. Is that what makes it significant?
Numbers?

A Well, in part numbers, yes.
But again, we could have a population-- For instance,
there are several situations where we found isolated
populations in very short sections of streams above
impassable falls. Now, we are concerned about these
because they constitute populations in themselves. They
may number only several hundred but we are interested
in preserving the genetic identity of populations and
you can't do that, of course, if you-- It is not
necessarily numbers we are concerned about, as I say,
preserving populations and we want to be assured that,
By a significant portion of the population I am
concerned that we don't want to reduce the population
size to the extent that there will be a long term
reduction in the population size.

Q No, but that, if I

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1
2 may say so, seems to me to be talking about impact.
3 What your saying is we don't want this pipeline to be
4 built in such a way that the population of a given
5 river is reduced below a level. Now, I understand that
6 I think, but how do you first decide if it is a sig-
7 nificant fish river, because if I understand correctly
8 it is only when you have isolated that river that your
9 then involved in making an extensive impact statement
10 about it.

11 A We are concerned about any
12 stream that has a population of fish in it. Now, there
13 are some streams where fish may enter for a week in the
14 spring and then they are found there at no other time
15 of the year. In some circumstances we would be con-
16 cerned about streams of this kind and in some circum-
17 stances we wouldn't. There are many instances, for
18 instance, where long-nose suckers will enter a spring,
19 or a stream, sorry, spawn in the spring, leave it and
20 be gone for the remainder of the year. These are
21 significant simply because they are spawning areas, even
22 though they are utilized for a very short period of time
23 and in fact, they may dry up somewhat later in the year.

24 Q Well, you see on that basis
25 I don't understand how the Firth gets to be more
26 important than the Malcolm in your list. Each of them
27 has fish. One has more than the other. One may even
28 have more varieties than the other for all I know. One
29 that you zero in on as being very significant and the
30 other you don't seem to be so troubled about.

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1
2 A Well, I am not terribly
3 concerned about the Malcolm because as I say-- Well,
4 let me go back. Obviously if there are fish that you
5 can eat or that people can utilize in some way, I think
6 that is a more valuable resource and more worthy a
7 study than a population nine spined sticklebacks in a
8 tundra pond.

9 Q Now, your making fun of me
10 doctor.

11 A No, I am not. I mean
12 obviously if they are utilized by people, or can be
13 utilized. This is one of the reasons, of course, that
14 I am more concerned about Arctic char than I am about
15 some species of mayfly that may occur on the North
16 Slope. I would be concerned about the species of
17 mayfly if, in fact, it were utilized by Arctic char or
18 by birds or something of this sort but the mayflies
19 in themselves don't have the same merit, in my mind,
20 as things that we can directly utilize.

21 Q Well, lets see if I can
22 list with you the things then that you look for before
23 you mark a river as having a significant fish
24 population. First of all, the last point you have
25 made, "A fish population that is useful either to other
26 animals, at the worst, or to people".
27
28
29
30

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 A Yes.

2 Q All right. Now what's
3 the next factor?

4 A In part, population size.

5 Q You mean -

6 A You tend to ^{concentrate} / your eff-
7 orts on those populations which are largest and if you
8 have to prioritize them, you'd normally study those and
9 put less effort on a population which is very small.

10 Q Yes, and you don't have
11 any regard for the species, except as that might be
12 reflected in its use by people or other animals?

13 A That's partly true, and
14 of course keeping in mind that some population of some
15 little obscure fish may be extremely important because
16 if its population is affected it may affect the
17 populations of fish which are directly utilized.

18 THE COMMISSIONER: Excuse me,
19 Mr. Scott and Mr. McCart. I've been passed a note
20 that two cars with these licence numbers:

21 2-243 and 11-187
22 are about to be towed away from the parking lot.
23 Those numbers again, 2-243 and 11-187.

24 MR. SCOTT: Q It's been
25 pointed out to me and I suppose you would consider
26 this, that stickleback are in fact a prime resource
27 for loons.

28 A Yes.

29 Q That would be a factor
30 -- I'm sorry?

Harlan, Hemstock, McCart

Williams

CrossExam by Scott

1 A I say Dr. Gunn pointed

3 Q And that would be a

7 A Well, most of the

13 Q Well, are there any

18 A Well, of course I

29 Q What concerns me about

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 this is the triggering point for much of the advice
2 that you give to Arctic Gas, your determination about
3 the significance of rivers and it strikes me that
4 this is a very complex and perhaps a highly personal
5 value judgment.

6 A You see, you can't
7 determine which rivers have significant populations
8 before you go out and look at them.

9 Q No.

10 A So that you have to build
11 the framework or the criteria for what are important
12 rivers as you go along, and when you start looking at
13 the North Slope, for instance, when we started looking
14 at the North Slope there was no information available.
15 Of course, to some extent it depends on what our
16 interests happen to be. If you're interested in slimy
17 sculpins and you build your academic career on
18 studies of slimy sculpins, then you might tend to look
19 at them in a much greater extent than someone who has
20 built their career, or started out working on salmon
21 and Arctic char and things of this sort. My bias is
22 towards the latter for that reason.

23 THE COMMISSIONER: You mean a
24 great deal depends on the accident of what someone
25 chose for his Ph.D. thesis ten years ago?

26 A Well, to a considerable
27 extent, that's true.

28 MR. SCOTT: I think that
29 emphasizes the point I'm trying to make, that it
30 seems to me the triggering point is a highly personal

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 judgment about what's important and what isn't in
2 terms of fish population.

3 A It's very difficult to
4 quantify, I think, in an area for instance that's as
5 complex as the Mackenzie Delta. It boils down to
6 judgment, yes, to a large extent.

7 Q And I take it that it
8 follows -- and I don't make any personal observation
9 here of course -- but it follows that the extent to
10 which your judgment is not shared by others, Arctic
11 Gas will have had less than complete advice, because
12 you will have zeroed in on the rivers that you regard
13 as important in this context.

14 A No, I think we are
15 prepared to make a comment about most rivers.

16 Q Have you been asked to
17 do that?

18 A Yes, we have comments
19 about the assessment for most of the rivers that are
20 found along the course of the pipeline. Now I must
21 admit that there are a number of very tiny little
22 streams that we have not looked at in great detail.
23 We can't look at every river, it seems to me. In fact
24 I'm not even certain that we want to look at every
25 river. In some instances, if you look at a ^{whole} series of
26 small streams you may be doing more damage by going in
27 there and collecting fish, etc. etc. etc., than if you
28 had simply looked at it and said, "O.K.,/I can classify ^{these}
29 with another particular stream that I have examined in
30 the past, it's of a similar kind, it's not necessary

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 for me to go in there and actually capture fish and
2 do a growth rate on these fish and things like that, do
3 a life history study."

4 Q Well then, when you've
5 isolated these rivers and done your work on them, and
6 are asked to pass a judgment on whether water can
7 safely be taken from the river at point "A" or "B"
8 or whatever point you're told the pipeline will be
9 near, how do you determine the quantity of water in
10 rough figures that can be safely withdrawn? Now let
11 me just separate that question into two parts. I
12 presume if it's like the Firth, as you were telling us
13 earlier and the fish are upstream at all material
14 times, as the lawyers say, then you say, "Well, it
15 can all be withdrawn because we're taking it from
16 downstream."

17 Now, what if that situation
18 doesn't occur, how do you decide what quantity of
19 water can be removed without damage to spawning or
20 juveniles, or whatever you're trying to protect?

21 A Well, our approach is
22 that we are going to these spring streams and things
23 of this sort and we're looking at the distribution of
24 fish and where we have fall spawners we're actually
25 looking at the distribution of eggs in the gravel.
26 In other words, we want to know what area, what surface
27 area^{at}/the bottom of the stream is used by fish at the
28 time that the water would be withdrawn. We can then
29 determine what proportion of the water can be withdrawn
30 without dewatering any significant proportion of the

Harlan, Hemstock, McCart
Williams

Cross-Exam by Scott

1 area that is actually being utilized. Now, our
2 preference is actually again in these cases to go
3 downstream of the area of utilization so that we can't,
4 it doesn't matter how much water you're going to draw,
5 you're downstream of it, It doesn't make any difference.

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1
2 Q Well, let's not
3 in
4 take the downstream case, because/the downstream case
5 the problem disappears for the reason that you have
6 just given. Let's take the other case and I
7 presume in that case Arctic Gas is going to say to you,
8 how much can we take out of here, at the relevant time
9 of year, or alternatively you are going to say you can't
10 take than X gallons or you can't take more than a
11 certain volume. Now, I presume these things aren't
12 done with mathematical certainty, or perhaps they are.
13 How are they done? How do you decide that kind of
14 question?

14 A You have to
15 find out what they are utilizing and you have to
16 assure yourself you are not going to dewater, let's say
17 a spawning area.

18 Q Well what they are utilizing
19 depends, is a volume figure isn't it?

20 A The fish?

21 Q What the fish or the eggs
22 are utilizing in the way of oxygen out of the water is
23 a function of volume of water and numbers of fish.

24 A I think it's probably more
25 important in the volume of water is the wetted area
26 that is available for the fish.

27 Q What do you mean wetted
28 area? The exposure of the pool to the air?

29 A The area-- No. The area
30 that is actually exposed to water.

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1
2 Q I see. Well then what do
3 you do with that when you have got it?

4 A Well it's easy. You have
5 to know what the distribution of the fish is, what
6 they are utilizing, where they are laying their eggs
7 and you have to assure yourself that with drawing X
8 amount you are not going to expose gravels to the air
9 that would have in the past been utilized for spawning
10 or utilized for over-wintering.

11 Q Well, surely you have to
12 go further don't you? It is not merely a question of
13 seeing that nothing is exposed to the air. Isn't it
14 also a question of seeing to it that a certain volume
15 of water remains above the gravel?

16 A Yes.

17 Q Or that the velocity, I
18 suppose the velocity isn't easily altered, but that the
19 velocity remains the same. How do you do those things?

20 A How do I do what now? How
21 do I determine what area they are utilizing?

22 Q Pretend I am the first in
23 your class and I want to be a fish biologist and I want
24 to advise the oil companies on how much water they can
25 take out of a creek?

26 A Yes.

27 Q Well what formula or what
28 process does one go through to determine that?

29 A Well, you count the fish.

30 Q I know the number of fish or

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1
2 the number of spawning areas, I know the depth of the
3 water, let us say and its velocity at given times of
4 the year, I know the wetted area. Now, what do I do
5 with all that collection of figures?

6 A Then you have to make a
7 judgment/ ^{as to} how much water you can remove without
8 materially reducing the stream area available to the
9 fish.

10 Q And I take it that that is
11 a guess based on experience and study?

12 A I think that if you had
13 enough cross-sections of a stream and so forth, you
14 can get these data by doing transects, that you could
15 probably come up with a fairly objective assessment
16 as to how much you could withdraw from the stream
17 without materially affecting the bottom area of the
18 stream.

19 Q Yes. And in appropriate
20 cases are you required to give Arctic Gas advise on
21 that matter? How much can be withdrawn?

22 A Well, this is what we are
23 attempting to for the North Slope spring streams, yes,
24 this approach.

25 Q Are you doing the same for
26 rivers that empty into the Mackenzie?

27 A For some of them we can.
28 In some cases I think it's unnecessary. Let me go
29 back again. I would recommend, I think, that in general
30 where you have a stream where there is a possibility that

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1
2 you might dewater an area, such as Vermilion Creek
3 downstream, that we would suggest that the majority
4 of the water be withdrawn from the Mackenzie for the
5 construction of snowroads and things of this nature.
6 Now, that may mean that you want to use water for
7 domestic use, or something like that in small quantities
8 from Vermilion Creek. But the majority of the water,
9 in areas like this where there is some question, it
10 should in my estimation be withdrawn from the Mackenzie.

11 Q I have been advised, for
12 example, that Wesch and Recharde have done a study on
13 trout eggs which probably has nothing to do with
14 the Mackenzie Valley in which they have established
15 the minimum velocity per second and the minimum depth
16 that is required to develop trout eggs.

17 A Yes, and I can raise trout
18 eggs on wet paper in the refrigerator if it strikes
19 me that that's what I want to do.

20 Q Well, I take it then that
21 you don't place any credence in that kind of analysis,
22 which based on experience analyzes circumstances in
23 which trout eggs succeed?

24 A Well, I haven't I must
25 admit, read that particular paper.

26 Q Well, you know the kind of
27 thing that I am discussing?

28 A Yes, I know the kind of
29 thing that you are discussing. I also know that to
30 a considerable extent the depth of water that is

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1
2 required is related to the size of the fish.

3 Q Well then is it fair to say
4 that it is your view that you would defer to the
5 judgment that you were talking about earlier rather than
6 that kind of analysis?

7 A Oh, I think so. Yes.

8 Q All right.

9 A I would also say that the
10 only places where you are likely to draw water down
11 significantly or sufficiently to affect the distribution
12 of eggs is in streams where your removing it during the
13 winter and where your talking about fall spawning
14 species.

15 Q Well, does that create
16 any problem for you in giving advise to how much water
17 can be withdrawn?
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Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 A Well, it is something that
2 we're certainly taking into consideration and this is
3 where our major concern is and on the North Slope
4 where we have Arctic char spawning in rather limited
5 quantities of water and as I said before, we're finding
6 out where they are distributed during the winter and
7 where they are spawning.

8 And in most instances, we
9 would recommend that water be taken only downstream
10 of the spawning and over-wintering areas, and not
11 upstream.

12 Q Would it be a fair princi-
13 ple to say that as a general rule, speaking not only
14 of the North shore but of the river or the tributaries
15 that enter into the river, but your principle is that
16 the water should be taken from downstream of the over-
17 wintering or spawning areas depending on the season
18 in which the work is being done and secondly that --what
19 was the second one? Well, that is the first principle
20 isn't it?

21 A That would be generally
22 true, yes.

23 Q And would the second
24 principle be that where there is any doubt on a tribu-
25 tary to the Mackenzie you go to the Mackenzie if you
26 can for water?

27 A If there is any doubt.
28 Let me go back to the first thing. There may be --
29 let's put it this way that certainly as a general rule
30 we want it withdrawn downstream unless there were large

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 quantities of water so that any withdrawal would be
2 an insignificant part of the total discharge.

3 Q Well now, one thing that
4 has whetted my curiosity. I'm told that in 1973, 1974,
5 in that winter season, on the North Slope of Alaska,
6 there was a critical shortage ~~or~~ what was regarded as a
7 critical shortage of water and that you might know
8 something about that.

9 A You are talking about in
10 the vicinity of Prudhoe Bay?

11 Q I don't know where it was
12 in the vicinity -- I'll have to listen to what you
13 have to talk about.

14 A Well, let me point out
15 about that situation.

16 Q Well, first of all,
17 before we get to it, can you tell me about the situation?

18 A I know a little bit about
19 it, I guess.

20 Q Well, you were an
21 advisor to Alyeska, weren't you?

22 A Yes, I was. But the
23 ^{there were} Prudhoe Bay situation, / an awful lot of other activities
24 going on besides the Alyeska situation. You must
25 realize that Prudhoe Bay is a long, long way from the
26 perennial ground water sources that we are talking about
27 when we are talking about the Yukon North Slope.

28 And that apparently they
29 were withdrawing water from pools and things like this
30

Cross-Exam by Scott

Where is Franklin Bluffs?

A Well, apparently they are -- excuse me -- I heard that they are developing a water source on the Kuparak, which runs in very close on the other -- just to the west of Prudhoe Bay -- but the

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 situation is this that these perennial ground water
2 sources that we wish to tap are associated with faults
3 along the edge of the. Lisburne limestone where the
4 Brooks Range falls off the foothills and if you are at
5 Prudhoe Bay and you look around you can see that it is
6 a very, very wide coastal plain there and the foothills
7 are many, many miles away, up to 40 miles from Prudhoe
8 Bay if you follow along the Sagavanirtoq River so that
9 the major sources are the closest ones are on the
10 Echooka and the Ivishak River, and that these are
11 a long ways from Prudhoe Bay, you see.

12 And so that the amount of
13 water that is bound up in ice and is lost in various
14 asundry other ways is very large so that the amount
15 of ground water available in Sag is probably very much
16 less than we would find right at these sources which
17 are, you know, right on just downstream of the pipeline
18 right-of-way in the areas that we're working. Because
19 we're working along the edges of the foothills.

20 Q And our Yukon coastal
21 strip is a good deal narrower than the coastal strip
22 that lies between the Brooks Range and Prudhoe Bay.

23 A Right. And for Spread C
24 for instance, the pipeline is essentially following the
25 line of the foothills.

26 A lot of these are
27 associated with approximately the 3,000 foot contour if
28 you follow around and you look at the distribution of
29 perennial springs along the whole of the North Slope
30 on into Alaska.

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1
2 Q And that geological
3 history that provides us with what you say ^{are} /more than
4 adequate sources of water along the North Slope of the
5 Yukon. And denies the Americans -- at least it did --
6 for a limited period of time that same plentiful
7 source of water is what hems us in so to speak on that
8 coastal plain and gives rise to the concerns that
9 Dr. Livingstone, for instance, expressed when he gave
10 evidence in the over-view about the disturbance to
11 the bird population along that narrow strip.

12 Well, that is not something
13 that you have to concern yourself with but I -- occas-
14 sionally I feel obliged to say something here just
15 to make sure that I have an incomplete if not complete
16 understanding of the implications of what is being
17 said.

18 MR. SCOTT: Q Well, Dr.
19 McCart, let me see if I understand. I take it that on
20 the north shore, you are comforted, at least in Canada,
21 by the fact that there are springs and sources of that
22 type that you have discovered, which indicate or which
23 you have pointed out to Arctic Gas indicate a greater
24 source of fresh water than might be percieved just
25 by looking at the rivers, lakes, and so forth. It is
26 a wintertime source.

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 WITNESS McCART: Arctic Gas is
2 comforted, yes, by the fact that there is water there.

3 Q All right. Well now, I
4 take it that that comfort that has recently been
5 provided to them, that is in the last two years or so,
6 the application and the answers to the Assessment
7 Group make no reference to any of these springs.

8 A Oh, they're mentioned in
9 Volume 15.

10 Q As a source of water?

11 A Not as a source of water,
12 but certainly everybody knew they were there.

13 Q Yes, I see. Well, I take
14 it that that is the source of comfort that removes what
15 in your judgment might otherwise be a reasonably critical
16 problem, and which was a critical problem in Alaska.

17 A I think I would agree
18 with what you're saying.

19 Q Well now, in Alaska of
20 course, they weren't building any snow roads. Now, would
21 you tell us what happened in Alaska?

22 A Well, I think that the
23 water requirement there was primarily for -- Prudhoe Bay
24 is surrounded by a series of ^{very} shallow ponds and things
25 of this sort that are not terribly useful as water
26 sources in the late winter. I'm not certain what the
27 water was being used for, but someone else might be
28 able to comment, but in large part, domestic use.
29 They simply had more people than they had water supply
30 for it during ^{the} last winter.

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 Q But this wasn't a problem
2 that only occurred at Prudhoe Bay, was it? Didn't it
3 occur right along the Alaska coast where any work was
4 being done?

5 A Well --

6 Q In other words, it's
7 not related to the requirements of the Village of
8 Prudhoe Bay, it's related to the construction camps
9 that were located there.

10 A I'm not sure I'm ever
11 following you. What are you asking now?

12 Q Well, what I'm getting
13 at, is I rather got from the response to your question,
14 or your response to my question that there was some-
15 thing about the consumer habits at Prudhoe Bay. I take
16 it what there is at Prudhoe Bay is some construction
17 camps building a pipeline and so the demand for water
18 came entirely from that source, as far as you know.

19 A No, there's an awful
20 lot going on at Prudhoe Bay besides pipeline construc-
21 tion.

22 Q Well, what did Alyeska
23 do?

24 A For water?

25 Q Yes,

26 A I'm not entirely familiar
27 with what Alyeska is doing for water along their pipe-
28 line route.

29 Q No, but --

30 A I am aware of the fact

Harlan, Hemstock, McCart
Williams

Cross-Exam by Scott

1 that at Prudhoe Bay there apparently developed a
2 shortage of water in late winter and that's all I'm
3 familiar with.

4 Q And what was done about
5 it?

6 A They simply had to go
7 farther and farther away in order to get their water.

8 Q How far away altogether
9 did they have to go?

10 A As I say, my understanding
11 is -- and I'm not very clear on this, I'm certainly
12 not an expert on their water problems -- but that they
13 were going as far as Franklin Bluffs, I think approxi-
14 mately 20 to 30 miles in order to get water.

15 Q Was water taken from any
16 places that gave you concern?

17 A Well, apparently -- and
18 this is hearsay -- they were taking water from some
19 over-wintering pools in the Sagavanirtok River.

20 Q And that would give you
21 concern?

22 A That was a concern, yes.

23 THE COMMISSIONER: Excuse me.

24 Now, and that was stopped and they were forced then
25 to go to the Franklin Bluffs 20 or 30 miles to the
26 south.

27 A I don't think it was
28 stopped; I think that they exhausted the sources of
29 water in that area, as I understand it.

MR. SCOTT:

30 Q Well, isn't it so, Dr.

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 McCart, from what you understand, whether -- without
2 making any judgment about it -- but without regard
3 to environmental considerations they had to have water
4 and they just went and took it from the closest place
5 they could get it?

6 MR. MARSHALL: Well it's
7 perhaps a little unfair to question Dr. McCart at
8 length about this, when he said he knows very little
9 about what the situation was, and the source of that
10 information is mere hearsay.

11 MR. SCOTT: Well, he was an
12 advisor to Akyeska, I'm sure he knows about these
13 things.

14 MR. MARSHALL: Not on water
15 sources, I don't believe.

16 WITNESS McCART: No, I haven't
17 been an advisor to Alyeska since 1973.

18 THE COMMISSIONER: Well, I
19 think --

20 A I certainly
21 wasn't advising them on water sources. I was advising
22 them on the potential impact of their pipeline on
23 fish.

24 MR. SCOTT: Well yes, but
25 we've already learned that there is no real distinction
26 between advising someone on fish and advising them on
27 how much water they can take out of a stream or a creek.
28 You've told us that those are two parts of your job.
29 In any event, I won't ask Arctic Gas to give an
30 undertaking that you will be retained to advise beyond

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 the permit stage. I'm quite certain that they will see
2 that that's done. Well now, I'd like just to ask you one
3 or -- before we get to that, these alignment sheets
4 we were just looking at, it's cross-delta alignment
5 sheet No. 1-K-0200-1002. I don't think you have to
6 get it out, because it's just one sentence I want to
7 read. It's Rapid Creek --

8 THE COMMISSIONER: Excuse me,
9 where's Rapid Creek again, just to --

10 MR. SCOTT: It's on the west
11 side of the delta, not far from Shingle Point,
12 I believe.

13 THE COMMISSIONER: Near the
14 Blow River. All right, I know.

15 MR. SCOTT: On this chart
16 there are notes, as you've described earlier, environ-
17 mental notes about fish and so on and under Rapid
18 Creek it says, it lists a whole lot of fish, "major
19 grayling spawning, no winter flow, sensitive May to
20 November," and those notes are quite typical of the
21 kind of notes that appear on the various alignment
22 sheets, and it says:

23 "Gravel borrow sites should be located outside
24 the active flood plain."

25 What was meant by that? That no gravel should be taken
26 from the active flood plain?

27 A That's what it means, yes.

28 Q How is that consistent
29 with what we understood the other day about being
30 perfectly all right to take gravel from the active

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 flood plain, or am I misunderstood?

2 A Well , this is a site
3 specific comment. This is not a braided stream in the
4 sense that the Firth and the Malcolm are and I don't
5 like the example that was presented several days ago.

6 Q Well, let me ask you this
7 If a buffer zone were established and it was -- and
8 arrangements were made so that the fish would not
9 enter the pond, there was no risk of ponding as Mr.
10 Williams told us there wouldn't be, why would you
11 make a comment like that?

12 A Because looking at the
13 plan as it was presented, I don't think the buffer
14 zone is sufficiently wide to satisfy me. I think this
15 is not a good example of a gravel site in an active
16 flood plain, from a fisheries point of view.

17 Q So, I take it that you
18 didn't mean to leave the impression with me that just
19 because a buffer zone were established and ponding was
20 regarded as not likely to occur, and there was no entry
21 for fish, that that meant you could take gravel, in
22 your judgment, from an active flood plain.

23 A I think it's a site
24 specific thing. In this particular instance, I think
25 that this is not a good place to put a gravel pit, from
26 my point of view.

27 Q Well now, let me come
28 to one other matter. Reading from Mr. Williams'
29 evidence at page 44, but I'd like your comment on
30 it. Maybe I could ask you to read to yourself the first

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 full paragraph on that page. It's quite long, rather
2 than -- have you finished, doctor?

3 A Yes.

4 Q Now, for either you or
5 Mr. Williams, the message I draw from that paragraph
6 is that natural loads of sediment, that is loads that
7 are placed in a stream or a river by the normal sea-
8 sonal activities of nature at certain times of the
9 year will be greater than the sediment loads resulting
10 from pipeline construction and some examples are
11 given such as ice jamming, which creates sediment
12 loads and so on. Is that the thrust of that paragraph?

13 A That's what it seems to
14 be to me.

15 WITNESS WILLIAMS: It is
16 qualified by saying, "that insofar as the Mackenzie and
17 other major rivers are concerned."

18 Q Yes, and in the sixth
19 or seventh line, you refer to lower reaches of the
20 tributary rivers. Now I take it that that is -- and
21 I asked Dr. McCart this, I think -- that that in terms
22 of injury to fish or fish eggs or juveniles, is not
23 a meaningful comment.

24 WITNESS McCART: No, it's the
25 sort of comment that engineers make and that fisheries
26 biologists don't make and in fact I think in our
27 critical areas report in Volume 15, chapter 2, if I'm
28 not -- maybe 3, but the point we make is that of course
29 it depends on when, what time of year this increase
30 occurs. The mere fact that it's less than that occurs

Harlan, Hemstock, McCart
Williams

Cross-Exam by Scott

1 that occurs naturally, is not important, it depends on
2 what time of year it occurs. If it occurs during
3 winter when loads are naturally extremely low, if
4 you artificially elevate it at this time it may be
5 detrimental to the fish population even though it's
6 much less than what they might have to put up with
7 the following spring.
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Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1

2

Q So, that just to

3

summarize, what we should be concerned about from the

4

point of view of fish populations is not merely the

5

volume of sediment compared to any other volume, but

6

the volume plus the location, plus the season, plus

7

the interest you are trying to protect, whether it be

8

eggs or what have you?

9

A Yes.

10

Q And it is the combination

11

of those four factors which enable you to make judgments

12

as to whether the siltation problem is serious or not

13

serious?

14

A That's right, yes.

15

Q So that we might, and perhaps

16

you have already said this, we might have a very modest

17

amount of sediment in one time and place and in relation

18

to one interest that would be damaging and another that

19

would produce large amounts of sediment that in the

20

circumstances would not?

21

A Yes, right.

22

Q I take it when we are

23

speaking of the interest to be protected meaning fish,

24

we mean not only fish but the aquatic life on which

25

fish may live in the bottom of rivers and streams?

26

A Right.

27

Q Excuse me one moment Mr.

28

Commissioner.

29

A I should point out that on

30

the Mackenzie River and those major tributaries that are

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McCart, Williams.
Cross-Exam by Scott

1
2 specifically referred to, I think that most of the
3 crossing will take place during early summer and early
4 fall when sediment loads are in fact quite high.

5 Q I'm sorry. I wasn't paying
6 attention, Doctor.

7 A I think that on page 44,
8 they are referring to the Mackenzie River and other
9 major rivers, major river crossings and that the
10 crossings are planned for a time when sediment loads
11 are in fact quite high.

12 Q No, but in the sixth line
13 Mr. Williams is talking about tributary rivers.

14 A Yes, but he is in fact
15 talking about the lower ends of tributary streams,
16 most of which are flooded back by the Mackenzie at
17 relatively high water levels, early in the summer for
18 instance.

19 Q But we understand that those
20 crossings and the risk of sediments from the crossing
21 at least will be made in the winter.

22 A That's right.

23 Q And the point I think I
24 have from you is that you cannot compare that situation
25 with what may happen in the runoff in the spring. That's
26 to compare apples and oranges and to get no meaningful
27 lesson about the damage to fish.

28 A That's right, with the
29 exception of the Mackenzie again.

30 Q Well, now one other obvious

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McCart, Williams.
Cross-Exam by Scott

1
2 question. I would like just to be sure I understand.
3 Is if silt enters a water course, a stream or a creek,
4 is there anything that you can control, or that you can
5 use to control it or to reduce its impact thereafter?

6 A I think I had mentioned a
7 few days ago that there are methods of putting in
8 stilling basins, using sand bags, things of this nature.

9 Q I am sorry. I haven't made
10 myself clear. A stilling basin, I take it, is something
11 to prevent silt or sediments from entering the water
12 course? Isn't it?

13 A No, in fact, you can form
14 settling basins in streams by putting in sand bag
15 dikes at intervals downstream of the source of sediment
16 and most of the sediment, or a large proportion will
17 settle out within the settling ponds.

18 Q On what size stream is that
19 a practical solution?

20 A Oh, I would say streams up
21 to the size of Vermilion Creek. I think you could do
22 it there.

23 Q All right. Well, now apart
24 from that is there any technique to control the impact
25 of silt or sediment that have already entered the water
26 course?

27 A Not that I-- No practical
28 methods that I can think of off hand. There may be
29 some, **that** I can consider. There have been plans
30 for giant gravel cleaning machines for Alaskan salmon

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

1
2 spawning streams, but I don't know whether they ever
3 got off the drawing boards or not.

4 Q Well, when the sediment--
5 Isn't this an almost classic illustration of a
6 circumstance in which there are no adequate rehabilitative
7 or restorative devices except the passage of time. Once
8 the sediment has entered the water in practical terms,
9 and leaving aside stilling basins, the damage has been
10 done, or is going to be done and there isn't much you
11 can do about it.

12 A Well, we have looked at
13 stream crossings on gas pipelines in British Columbia
14 to see what we can determine. We have looked at large
15 numbers of pipeline stream crossings in Alberta, also
16 on the East Slopes and what we find, of course, is well
17 that may be true. In most instances we can't detect
18 any significant difference after the first spring
19 freshet between upstream and downstream areas.

20 Q Your telling me now that
21 nothing is going to result from the entry of ~~11/1~~
22 sediment and that may be so.

23 A No, I am saying that in the
24 short term your right. But after the first spring
25 freshet, we would expect that most of this fine material
26 would have been carried out of the system and that it
27 would have been rehabilitated as long as you prevent
28 a continuing sedimentation.

29 Q Well, that's not
30 rehabilitating is it? That simply speaks to the length

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McCart, Williams.
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2 of impact. After a season the impact of the sediment
3 will be over.

4 A Okay, but your crossing a
5 small stream and the only ones-- Let's put it this
6 way. Negative effects of sedimentation are/^{most}likely to
7 occur in small streams because of the high ratio of
8 sediments to water flow. In these situations your
9 going to be crossing these things during the course
10 of the winter and in many instances there may be no
11 flow at all. We would expect that if you can in fact
12 restrict sedimentation down the pipeline right-of-way
13 the following spring, that the spring should be
14 rehabilitated before any spawning has occurred in the
15 stream. If it were a grayling stream, you go through
16 it in the winter, The materials are flushed out that
17 spring, and the graylings spawn as the spring flood
18 is waning, after the thing has already been cleaned.

19 Q And if it is a char stream?

20 A In the instance of a char
21 stream you would have some difficulty if you were
22 crossing in the winter upstream of the spawning area,
23 that this material would settle out on the bottom, but,
24 let me go back again, we are not crossing any char
25 streams on the North Slope in an area where we know
26 spawning could be occurring.

27 Q I am grateful that nothing
28 is going to happen as a result of this project. The
29 point I am trying to make now is simply one of principle.
30 And that is that once the sediment has entered the stream,

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2 and leaving aside the duration of its impact, which may
3 be longer or shorter, there is nothing in practical
4 terms that can be done by man or engineers to lessen
5 its impact whatever it may be.

6 A No, your right.

7 Q So, --

8 A You have to wait for the
9 natural cleansing processes to operate. So obviously
10 the thing to do is to make sure that very little
11 sediment enters these streams.

12 Q It is a classic case for
13 that proposition isn't it? There are so many other
14 things we have heard about, slopes and all the rest of
15 it, where the damage can be done and restored. Whatever
16 the damage may be from sediment, it cannot be restored.
17 If char eggs should be killed as a result of sediment,
18 nothing can be done about that by man.

19 A No, other than setting up
20 a hatchery program which no one would propose to do.

21 Q Right.
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Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 THE COMMISSIONER: Excuse me.
2 Nothing can be done about it except setting up a
3 hatchery program which the Federal Government is doing
4 for instance in British Columbia, there's a number
5 of Federal Government fish hatcheries in British
6 Columbia. Are you saying that without a hatchery pro-
7 gram, the fish population on a given stream, a given
8 river, would not re-establish itself at the earlier
9 level? You're not going that far, are you?

10 A No. What I'm saying is
11 that that particular batch of eggs is dead, it's
12 dead. I mean that's the point, isn't it?

13 It seems to me, as I said
14 before, we don't know of any char spawning areas that
15 are going to be affected like this by stream crossings.
16 Hatcheries are not really successful if you look at
17 the history of catches in British Columbia, salmon
18 catches, for instances, it's been going down and has
19 been since fishing began on the coast, and in fact
20 hatcheries have been largely abandoned in favor of
21 other possibilities such as artificial spawning beds
22 and things of this sort.

23 Q Well, without turning
24 this into a discussion about British Columbia salmon
25 population, salmon catch, the intervention of man,
26 the blasting to build the railway to the Fraser River,
27 was that the biggest factor in reducing the Fraser
28 River salmon population?

29 A No, I think the basic
30 thing is habitat degradation, degradation of spawning

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1 areas and things of this sort, rearing areas.

2 Q How farther up the
3 Fraser system?

4 A If you're speaking of
5 the Hell's Gate situation?

6 Q Yes.

7 A That certainly had an
8 enormous effect on upriver populations. But aside
9 from that I think that basically what's happening
10 to coho and chinook populations and things of this
11 sort is that there's been habitat degradation to the
12 streams that they formerly utilized, and a lot of them
13 are no longer available to them.

14 Q You mean all up and down
15 the coast?

16 A Yes.

17 Q Well, without -- when
18 they were building the Canadian Northern, or whatever
19 the second railway was called before it became the
20 C.N.R., around 1914 they managed to blow part of a
21 mountainside into the Fraser River near Hell's Gate.
22 We were led to believe that was the biggest single
23 incident, rather than something that occurred over
24 a period of time, that would be a fair assumption,
25 would it?

26 A Yes, as far as the
27 Fraser River specifically goes, yes. Many of those
28 populations seem never to have recovered, the ones
29 in the very uppermost Stewart-Tatla Lakes and those
30 areas.

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 Q Well, what about say Adams
2 River where that has been protected by the intervention
3 of may from interference ^{of man,} / would that be a fair
4 statement about that particular source?

5 A I'm not quite sure I
6 understand what you're asking.

7 Q Well, you said that the
8 farthest upstream on the Fraser system had been
9 -- the spawning habitat has deteriorated owing to --

10 A No, no, I'm not saying
11 that. I'm saying that the ones furthest upstream, the
12 ones that had the furthest to go were the ones that
13 were most affected by the Hell's Gate situation.

14 Q Oh, I follow you, I
15 follow you, yes.

16 A Because you've only got
17 a certain amount of energy available for swimming,
18 and if you expend a large proportion of it trying to
19 get past Hell's Gate, you've got very little left,
20 to take you up to Stewart Lake; whereas the ones that
21 were closer were less affected in general than the
22 ones that had to make a much, much longer journey.

23 Q So that's why Adams River
24 would not have suffered in the same way as Stewart and Tatla.

25 A Yes.

26 THE COMMISSIONER: Yes, O.K.

27 MR. SCOTT: Q Dr McCart, are
28 there any useful figures that will relate the concentra-
29 tion of silt in water to various kinds of organisms
30 and their development? Are there studies to which you

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Williams
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1 can refer which will tell you that at a given time and
2 at a given place the silt proportion in water should
3 not be greater than X or Y?

4 A Well, one of the big
5 problems of this kind of study, there have been some
6 studies standardizing your silt, you see you have
7 to use dietenacious earth, or you have to use this
8 or that or the other thing. If somebody is using
9 Mackenzie River silt, it doesn't give the same results
10 as the silt from some other source, so that I don't
11 think that very much of this information is very useful
12 and you find that there's a tremendous disparity
13 between levels that are supposed to cause mortality
14 in fish in one study, and the levels which are supposed
15 to cause mortality in the same species in another
16 study. As far as eggs go in the gravel, probably the
17 best single thing you can do is go out and measure
18 gravel permeability, using a stand pipe, and there's
19 a fair background on what you might expect in good
20 spawning gravels for large-cell monad fishes of the
21 sort that Arctic char are.

22 Q Well, do you regard this
23 kind of approach as a useful approach in determining
24 the amount of sediment or silt that can be introduced
25 without damage, or do you again have to rely on your
26 experiential judgment?

27 A Well, if I were to do a
28 monitoring study, and I wanted to compare the effects
29 of sediments or I wanted to examine the effects of
30 sediments on populations of eggs in the gravel, I would

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1 prefer to measure permeability, and compare a control
2 area with an area in which sedimentation has occurred
3 and try and correlate those things with mortality
4 to eggs.

5 Q Well, I take it then
6 that you don't have much confidence in the kind of
7 studies that -- or the kind of figures that are pro-
8 duced in what I understand is called the Blue Book
9 that give percentages of sediment that can be
10 present in water?

11 A A lot of these are water
12 quality standards for industrial use and drinking water
13 use and things of this nature, and really it's
14 difficult to relate these things to the effect that
15 it might have on some particular species of benthic and
16 /or fish eggs. You see, if the stuff never settles out
17 on the bottom, it seems to me that fish eggs can
18 survive, despite the fact that the water may be
19 relatively turbid.

20 Q Well, for example, I
21 am advised that the Environmental Protection Agency
22 has certain standards -- 25 million grams per
23 litre, milligrams produces a high level of protection;
24 80 is a moderate level of protection;

25 A 80 milligrams per litre?

26 Q Yes. Do you have
27 any confidence in that kind of approach, or do you
28 think the whole thing is so site specific that we
29 shouldn't trouble ourselves with that kind of
30 standard?

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Williams
Cross-Exam by Scott

1 A Well, it all depends on
2 whether there's anything there to be affected or not.
3 You know, look, I can tell you we have those kind of
4 data for North Slope streams. We can't detect suspended
5 sediment in most of them under the ice during the
6 winter. In other words, we get essentially zero milli-
7 grams per litre, and 80 of course would be consider-
8 ably more than that and might have a detrimental
9 effect on populations if there's anything there to be
10 affected. Certainly if there were eggs on the bottom
11 and you cranked the sediment loads up to 80, and the
12 carrying capacity of the stream was rather low, and
13 a great proportion of this settled out on the bottom,
14 it could have a detrimental effect on Arctic char eggs,
15 certainly.

16 Q All right. Well then,
17 what use, if any, do you make of that kind of informatio
18 in coming to your judgment?

19 A I don't --

20 Q If you don't think this
21 kind of study is of any use --

22 A I don't.

23 Q -- that's all you have
24 to say.

25 A As I say, you know --
26 THE COMMISSIONER: You don't
27 think those criteria are of any use.

28 A No, I don't think anybody
29 knows enough about North Slope streams to really be
30 able to say very much about what's a natural load and

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 what isn't a natural load.

2 MR. SCOTT: Q I understand
3 that Alyeska followed a special procedure in dealing
4 with small streams -- I'm getting the sense of your
5 answer from your expression. Perhaps you can tell
6 us about it.

7 A No, you better tell me
8 this time, I'm not going to walk into anything like
9 that.

10 Q I understand that in
11 small streams, and perhaps all of them, I don't know
12 whether they restricted it to critical streams or
13 not, they in effect developed a kind of by-pass whereby
14 the water was brought from the stream in pipes or
15 hoses or something around to below the river crossing
16 with the aid of a dam at one end, and that that enabled
17 the construction company to build the crossing without
18 water passing over it.

19 A Sounds like an excellent
20 idea.

21 Q I beg your pardon?

22 A I say it sounds like an
23 excellent idea.

24 Q Was that part of any
25 recommendation that you made to Alyeska?

26 A I don't think we mentioned
27 that specifically. It seemed to me it was in the air
28 at the time. I've seen similar things done, as I
29 said, I think, a few days ago on the Sarnia to
30 Montreal Pipeline and I was quite impressed.

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 Q Is there any value of
2 that in winter construction?
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Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 A I think where you might
2 have winter flow it might be useful to do that kind of
3 thing, certainly.

4 Q Now, Mr. Hemstock, Mr.
5 Bayly asked you this afternoon about the possibility of
6 changing the source of power at compressor stations to
7 hydro-electric power. Some time ago, Mr. Purcell of
8 Arctic Gas told us how it was proposed, in fact, to do
9 it that they would bleed natural gas off the main line.

10 And, he also indicated that
11 the deciding factor in that determination was economics.
12 Mr. Bayly has asked you about hydro-electricity. I
13 would like to ask you about the burning of hydro-carbon
14 liquids. I understand that the gas processing plants'
15 power source has been changed from natural gas to
16 hydro-carbon liquids and I wonder if, in view of that
17 change, any consideration has been given to changing
18 the power source of at least a number of the compressor
19 stations near the top of the line.

20 WITNESS HEMSTOCK: A I'm not
21 aware that any consideration has been given to using
22 liquids in the turbines.

23 Q I take it that as the price
24 of natural gas increases, there will be economic virtue
25 to burning the less economically desirable hydro-carbon
26 liquids.

27 A That would obviously be the
28 case until an oil pipeline becomes available. At that
29 time that those liquids could be mixed with a crude
30 oil stream and I suppose then it might be a balance on the

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Williams,
Cross-Exam by Scott

1 the economics of the, simply of the two products.

2
3 Q You would agree, would you,
4 that if hydro-carbon liquids are utilized, that is going
5 to alter the sulphur dioxide emission problem from its
6 present situation. In other words, as I understand it,
7 sulphur dioxide is likely to be more concentrated in
8 hydro-carbon liquids or sulphur is and is therefore
9 going to be emitted in larger quantities if hydro-
10 carbon liquids are burned.

11 A I don't have an analysis
12 of the sulphur content of the liquids. My understanding
13 was that they were virtually sulphur free as well but
14 I would have to check that.

15 MR. MARSHALL: Do you require
16 that information, Mr. Scott?

17 MR. SCOTT: Well, I think,
18 first of all, it would be useful to know if any serious
19 consideration is being given by Arctic Gas to this fuel
20 source. If the answer is "No", obviously we don't
21 have to pursue it, but if the answer is "Yes", we may
22 do.

23 MR. MARSHALL: I gather the
24 answer is "No".

25 MR. SCOTT: Well, no, Mr.
26 Hemstock said he wasn't aware of it. If no consideration
27 is being given to it, I would be grateful to know.

28 WITNESS HEMSTOCK: We can find
29 that out.

30 MR. SCOTT: Q I take it

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 that if there were moves to hydro-carbon liquids this
2 would alter the environmental impact of the project
3 in at least some particulars.
4

5 A Yes, it would involve
6 either piping or storage of the liquid fuel. That
7 is probably the major change.

8 Q Turn to page 56 of the
9 prepared evidence. On the bottom of that page, you
10 are comparing your readings for nitrogen dioxide
11 concentrations at ground level with the requirements
12 of the federal ambient air quality objectives. Do I
13 have that right?

14 A Yes.

15 Q And, as I understand it
16 the maximum desirable long term ceiling is .032 ppm
17 as found in those objectives.

18 THE COMMISSIONER: That is
19 something that you haven't gleaned from the prepared
20 evidence. That is something you have gleaned from
21 the government document, is that it?

22 MR. SCOTT: That's correct, sir.

23 MR. MARSHALL: Could you give
24 me that again, Mr. Scott?

25 MR. SCOTT: No, I'm sorry I
26 am told they have been quoted.

27 MR. MARSHALL: Page 55.

28 MR. SCOTT: I only have page
29 56 in front of me but they may be --

30 MR. MARSHALL: Starting at

Harlan, Hemstock, McCart,
Williams
Cross-Exam by Scott

1 54, the objectives as established under the Clean Air
2 Act are set out. You are talking about the maximum
3 desirable concentrations of --

4 MR. SCOTT: No, as I understand
5 it, there are two standards. One is the maximum desir-
6 able long term ceiling, .032 and the maximum acceptable
7 long term ceiling which is .053. Do I have that right,
8 Mr. Hemstock?

9 WITNESS HEMSTOCK: A Well,
10 the figure which we have which is at the top of page 55
11 says the maximum acceptable concentration of SO2 or
12 60 micrograms per cubic meter which is .02 ppm average
13 annual.

14 Q I'm sorry I am talking
15 about the nitrogen dioxide figures. They are, I think
16 found at the top of page 56.

17 A .05 ppm average annual
18 and the maximum desirable is .03.

19 Q Yes.

20 Now, if you look at the
21 figures that you have set out in the last paragraph
22 on page 56, and those figures are for calm conditions
23 that is, for no wind, at 10 miles per hour, at 5 miles
24 per hour and at one miles per hour of wind. Now, if you
25 look at those figures, I take it that only one of them,
26 the one at one mile per hour is below the maximum
27 desirable and one or two depending on how you read
28 them is below the maximum acceptable.

29 A That is spelled out as
30 being under intense inversion conditions. Is that not correct?

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Williams
Cross-Exam by Scott

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2 Q Yes, but isn't it true
3 to say that those figures, only one of them is below
4 the maximum desirable and two are below the maximum
5 acceptable?

6 WITNESS HEMSTOCK: For the
7 conditions of intense inversion, which of course do
8 not occur year-around.

9 Q Yes, but --

10 A To get your average
11 annual you would have to calculate this, together with
12 the conditions under normal atmospheric conditions.

13 Q Well, how can you say, as
14 you do, bearing in mind those figures on page 56, page
15 56 at the bottom of the second paragraph,

16 "In all cases these calculated quantities are
17 below the levels stated in the objectives for
18 the period of time in which they could occur."

19 A Well, I will have to
20 check with Western Research. I am assuming that that
21 is based on their calculation of the period of time
22 during the year when there is intense inversion/^{of} condi-
23 tions averaged over the annual -- over the period of
24 year to bring this, in their judgment, within the limits
25 of the Federal Air Quality Standards.

26 Q Well, I'd be grateful
27 if you'd check that.

28 MR. MARSHALL: Mr. Scott, are
29 we on common ground that the figures that you quoted
30 are for the average annually?

MR. SCOTT: As set out, yes.

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Williams
Cross-Exam by Scott

1 MR. MARSHALL: And the statement
2 on the page that's talking about intense inversion
3 conditions, are you suggesting that intense inversion
4 conditions would be so widespread that the average
5 annual allowable limits would be exceeded?

6 MR. SCOTT: The question I
7 raised, Mr. Commissioner, is that the figures that are
8 given in the transcribed evidence don't justify the
9 conclusion that is drawn on page 56. Now there may be
10 some other explanation which provides a justification.
11 I don't ask Mr. Hemstock to have it with him. If there
12 is such a justification that isn't apparent to me,
13 I'd be grateful to know what it is.

14 THE COMMISSIONER: Well, we
15 don't seem to be getting very far with this. Maybe we
16 ought to adjourn now till tomorrow morning.

17 MR. SCOTT: I'm almost finished,
18 but I suppose this panel isn't going tonight anywhere
19 anyway.

20 Q If Mr. Hemstock or Mr.
21 Marshall could let us have the reports from Western
22 Research to look at, that might solve the problem. It's
23 just that it appeared to us that there was a conflict
24 in the figures given and the conclusion drawn.

25 MR. MARSHALL: Mr. Hemstock
26 has those.

27 THE COMMISSIONER: May I ask
28 a question? The other counsel have completed their
29 cross-examination of this panel, have they?

30 MR. SCOTT: Yes sir.

Harlan, Hemstock, McCart
Williams
Cross-Exam by Scott

1 THE COMMISSIONER: On water --

2 MR. SCOTT: Terrain and air.

3 THE COMMISSIONER:-- and air.

4 MR. SCOTT: I really have only
5 one other subject, and it may be unnecessary to pursue
6 it. It relates to petroleum and chemical spills Mr.
7 Commissioner there is a question and answer posed
8 by the Assessment Group and made by Arctic Gas, which
9 is question 53. Perhaps I could just read two paragraphs
10 from it to make clear the problem that confronts us at
11 this stage. The question first of all asked the
12 applicant to indicate quantities of fuels, etc.,
13 secondly modes of storage, methods of transfer, and
14 three, amount of loss of the various materials from
15 spillage or wastage at the stockpile site and four,
16 mobility and persistence of the various materials cov-
17 ered in No. 1, and procedures to contain and clean up
18 spills. Then in paragraphs 53.3 and 4 the applicant
19 responded:

20 "Because of the flammable properties of fuels
21 and methanol and because of their value, the
22 same care which is used in storage and transfer
23 of such liquids under normal conditions will
24 be used to handle these liquids during con-
25 struction of the pipeline so that virtually no
26 spillage is expected. In the event of an
27 accidental spill of fuel or methanol, physical
28 cleanup techniques will be used to contain and
29 recover the spilled substance. Because new
30 techniques are currently being developed to

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Williams
Cross-Exam by Scott

1 contain and recover hydrocarbon spills,
2 the final choice of each specific technique that
3 will be used to contain and recover spills
4 has not yet been made. However, the employment
5 of dykes to contain a spill and suction
6 pumps and absorbent substances to recover the
7 spill is likely."

8 Now, sir, I understood from Mr., either Mr. Marshall or
9 Mr. Hemstock this afternoon that Mr. Hemstock was in
10 the course of preparing some material on this general
11 subject and I would be disposed to defer cross-
12 examination if that is to be forthcoming; and what
13 I'm really interested in is two things: First of
14 all an estimate from the applicant as to the extent
15 to which he anticipates having to confront this problem.
16 In other words, how many spills or accidents is he
17 planning for?

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Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

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3 --understanding that
4 they will occur even in the best regulated affairs.
5 And secondly and in some detail, what are the
6 contingency plans? At the date of the answer of the
7 assessment, I gather no selection had been made. Now,
8 if Mr. Marshall tells me that that can be dealt with
9 at some other time in some other place, I won't ask
10 Mr. Hemstock a whole lot of questions that--

11 THE COMMISSIONER: Let Mr.
12 Marshall confer with Mr. Hemstock.

13 MR. MARSHALL: Mr. Hemstock
14 will be with us on the next Arctic Gas panel and very
15 likely as well when we are dealing with the cross-delta
16 and I would expect that at one of those occasions he
17 could respond to your questions Mr. Scott.

18 MR. SCOTT: I would be grateful.

19 MR. MARSHALL: If that would
20 be satisfactory.

21 MR. SCOTT: I would be
22 grateful if before that time, sometime before that
23 time Mr. Marshall could let me have a summary of what
24 he proposes to say with respect to those things so we
25 can examine it.

26 MR. MARSHALL: We'll see what
27 we can do. Mr. Scott there was a request for some
28 information from the panel about design of river
29 crossings and Dr. Harlan put in a call over the break
30 and has some information if you want, if you would like

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McCart, Williams.
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2 to get that on to the record now while you still have
3 the panel available. Perhaps Dr. Harlan could comment
4 on information he obtained and I think Mr. Hemstock
5 has something to add to it as well.

6 WITNESS HARLAN: Yes, during
7 the supper break I talked with Dr. Hollingshead who is
8 head of our river engineering group with Northern
9 Engineering and I am informed by Dr. Hollingshead ~~the~~
10 Northern Engineering has recommended that individual
11 designs be developed for approximately two hundred and
12 fifty river and stream crossings. Of these a hundred
13 and fifty are in Canada, north of sixty. The criteria
14 that has been used in the selection of those streams
15 and rivers for which there will be individual designs
16 is primarily an engineering consideration. This includes
17 the scour depth, for example, if the scour, the
18 anticipated scour is greater than four to five feet,
19 an individual design will be developed. An individual
20 design will also be developed if, for example, there
21 is problems in the approach, slope stability problems.
22 In the judgment of our river engineering group, they
23 do not feel that environmental concerns would have a
24 great influence or change on the river crossing design
25 per se. It would however, affect the auxiliary measures
26 that will be provided, for example, to prevent siltation
27 or erosion of the river banks. I have also been informed
28 that the designs for the individual river crossings will
29 be provided to our environmental staff for their review
30 and we will solicit their comments on these.

Harlan, Hemstock,
McCart, Williams.
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THE COMMISSIONER: Do you wish
to add something Dr. Hemstock?

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WITNESS HEMSTOCK: No, I
think that that's covered it with the exception of
perhaps the note that it would appear from the number
that that would take care of all of the streams with
which Dr. McCart would have concern. However, he will
be asked to check those and there might well be an
occasion perhaps where a stream, did not from an
engineering viewpoint appear to be critical, but which
he would like to have a design check. I would think
that those kind of cases though would be quite rare.

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THE COMMISSIONER: Perhaps
since the panel won't be able to get a plane out early
in the morning, they could be asked to stand by at 9:00
in case you wish to ask further/on that matter Dr.
Harlan has just dealt with.

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MR. SCOTT: I am obliged, sir.

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THE COMMISSIONER: So that
subject to that one matter that completes the cross-
examination of this panel. Does it Mr. Scott?

MR. SCOTT: Yes, sir.

THE COMMISSIONER: Well thank
you very much Mr. Hemstock, Dr. McCart, Dr. Harlan and
Mr. Williams and we'll ask you Dr. Harlan just to stand
by tomorrow at nine when we will reconvene and there
may be some, few questions Mr. Scott has for you about
that matter of river crossings and then we'll go right
ahead with the Foot Hills panel, Mr. Gibbs. And we'll

Harlan, Hemstock,
McCart, Williams.
Cross-Exam by Scott

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finish phase two I should think this week and move
on to phase three, Monday, next week.

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(PROCEEDINGS ADJOURNED UNTIL NOVEMBER 13, 1975)

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